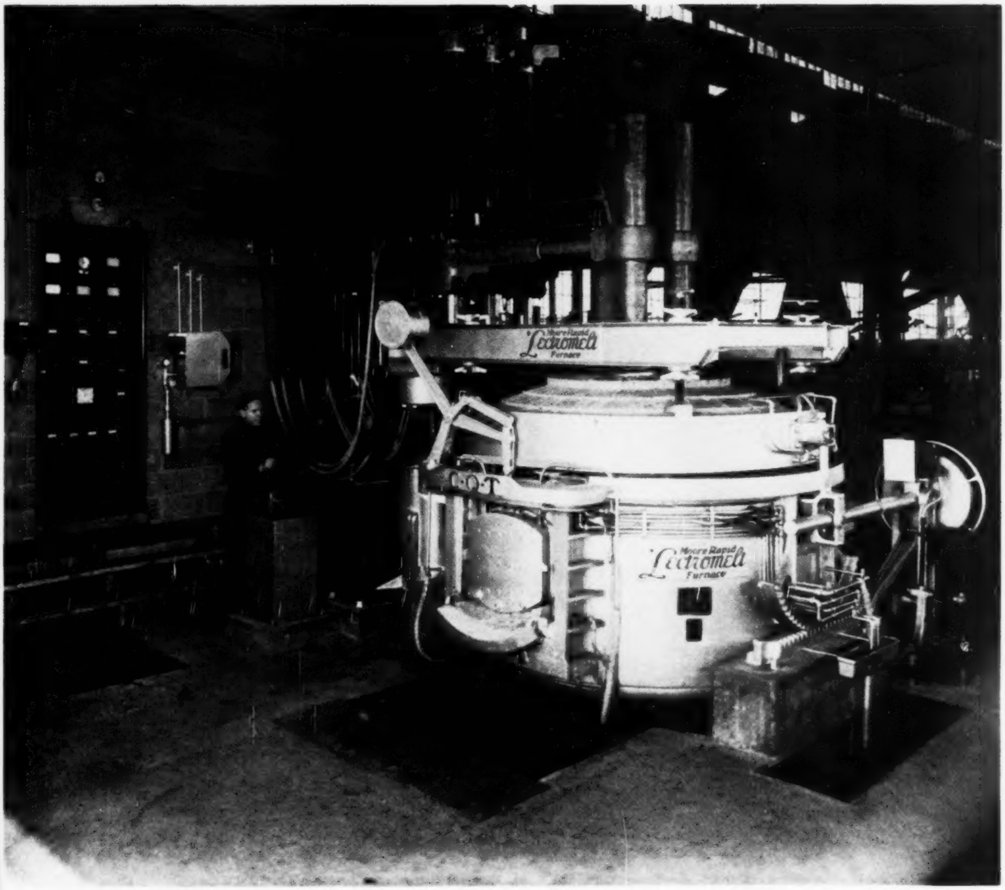
MAY

1949

POST-CONVENTION Issue

American Foundryman

THE FOUNDRYMEN'S *Own* MAGAZINE



Precise and dependable control of the analysis of any melting heat is invaluable to good foundry work—and that's the kind of control provided by the famous patented counterbalanced electrode arm control system on Moore Rapid Lectromelt furnaces, like the Size CQT pictured here. This furnace was recently placed in operation in a mid-west steel foundry. The "floating arm" condition which results from counterbalancing an electro-mechanical arm is unusually sensitive to quick precision positioning of the electrodes. You get what you want with Lectromelt's controls.

Lectromelt Furnaces are built in sizes ranging from 100 tons to 250 pounds. Write today for complete details.

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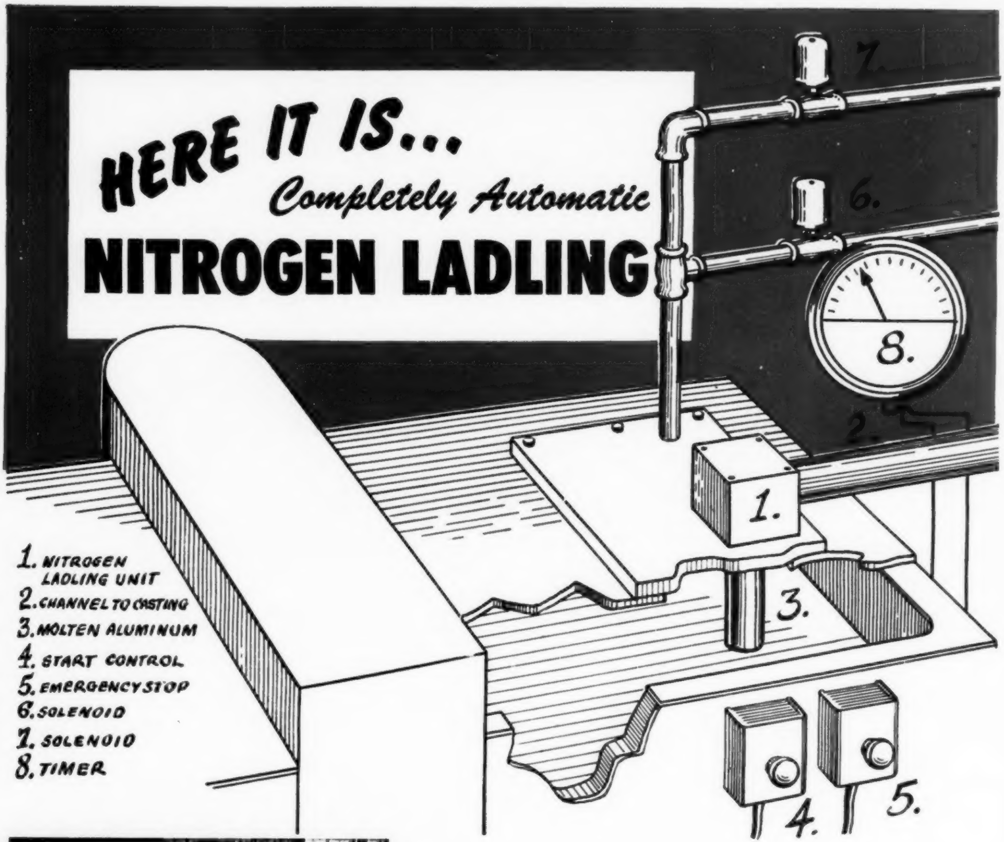
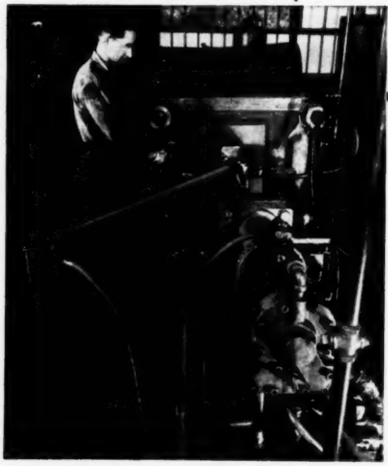
FURNACES

manufactured in: CANADA, Lectromelt Furnaces of Canada, Ltd., Toronto 2; ENGLAND, Birlec, Ltd., Birmingham; SWEDEN, Birlec Elektkougnar A/B, Stockholm; AUSTRALIA, Birlec Ltd., Sydney; FRANCE, Stein et Roubaix, Paris; BELGIUM, S. A. Belge Stein et Roubaix, Bressoux-Liege; SPAIN, General Electrica Espanola, Bilbao; ITALY, Forni Stein, Genoa.





HAND LADLING *is Obsolete!*

Lindberg-Fisher announces a revolutionary development in handling molten aluminum—completely automatic nitrogen ladling.

Now . . . for the first time, mass production techniques can be applied to your casting production. Here are some of the many advantages available with Lindberg-Fisher Nitrogen Ladling:

- ★ **Increased production.**
- ★ **Precise, mechanically controlled casting shots.**
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- ★ **Safer operation with mechanically handled hot metal.**
- ★ **Reduced casting rejects from fatigue, human errors, etc.**
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- ★ **Reduced metal losses.**
- ★ **Greatly improved working conditions.**

For the story of nitrogen ladling, call your Lindberg-Fisher representative or write Lindberg Engineering Company

LINDBERG-Fisher MELTING FURNACES

A DIVISION OF LINDBERG ENGINEERING COMPANY
2440 West Hubbard Street, Chicago 12, Illinois

VOLUME XV, NUMBER 5

May, 1949

American Foundryman

Official publication of American Foundrymen's Society

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AMERICAN FOUNDRYMAN is indexed regularly by Engineering Index, Inc.

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CUT COREROOM COSTS and IMPROVE PRODUCTION with

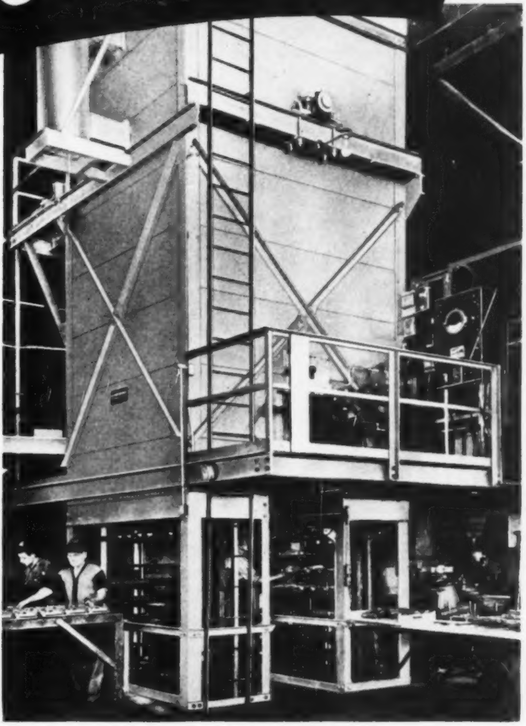
COLEMAN TOWER Ovens*

Coleman Tower Ovens cut coreroom costs and improve production in at least 4 different ways:

1. **PATENTED OPEN CENTER:** Provides close, efficient grouping of coremakers around the oven. The exclusive 3-way loading feature increases accessibility 300% over ordinary vertical oven designs. Cuts carry time... increases productivity.
2. **AMAZING FLOOR SAVING:** The elimination of racks, aisleways, and large working space required by batch ovens permits savings up to 75% in floor area. Less space...greater output.
3. **RECUPERATIVE COOLING SYSTEM:** Cores are "smoked off" and cooled before they reach the unloading station, making for better working conditions. The heat recovered from the cores is used over again, resulting in large fuel savings.
4. **PERFECT BAKING:** Eliminates rejects and make-overs. Coleman Heating Systems for gas, oil, stoker-coal or electricity; whichever fuel is most economical in your locality.

Over 10,000 installations of Coleman Ovens are proving their extraordinary money-making ability in every type of foundry in the United States today. It will pay you to investigate today.

* Trade Mark Reg. U. S. Pat. Off.



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Precision Built to Meet Your Foundry Needs

DALLETT Pneumatic Vibrators are valveless, simple in design, but sturdy in construction. They are engineered for dependability, long life and top performance.

They are made in two series, the "MPV" for Match Plate Foundry work, and the "M" Series for heavy forms, loading hoppers, dust arrestors and for many other heavy duty requirements.

Illustrated is the Dallett "MPV"—7. This series is available in four sizes.

Only One Moving Part

Both Series of Dallett Pneumatic Vibrators have *but one moving part—the piston.* There are no springs to be replaced. Dallett's springless construction means less breakdowns for you, saves costly replacement time and money.

Trouble-free Construction *Means More Production*

Smooth operation and high efficiency are assured in all Dallett Vibrators because of their *precision* construction. All barrels and pistons are carefully heat treated and precision ground. Standardize on Dallett Pneumatic Vibrators for maximum performance.

Send for Bulletin 100

This bulletin fully describes and illustrates Dallett's Line of Pneumatic Tools. For Dallett Forged Products ask for Bulletin #200. Complete Airline Accessories are covered by Bulletin #300.

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Manufacturers of Pneumatic Tools and Accessories

DISTRIBUTORS in principal cities throughout the United States, Canada, Europe and South America.

Lynchburg foundry

mexacote

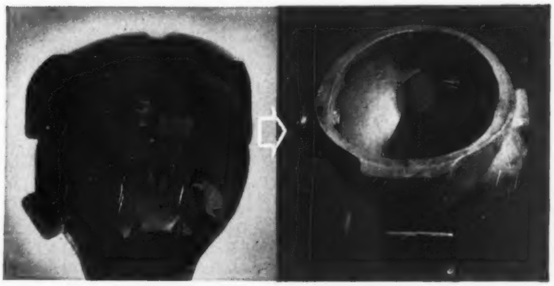
Lynchburg worker spraying green resin core for clutch housing with a 15° Mexacote solution. Green resin core for transmission is waiting to be sprayed. Baked cores may be dipped for Mexacote treatment.

Mexacote-sprayed green resin core for clutch housing is placed in the oven for drying. Some cores are first baked and then given a 40° Baume' coating of Mexacote.

THE UNITED STATES GRAPHITE COMPANY

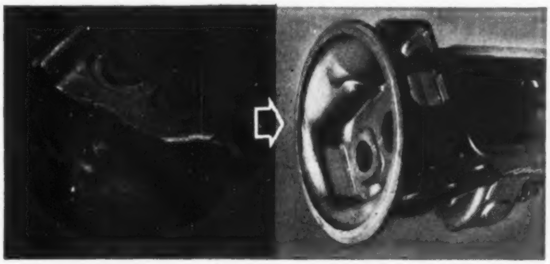
sprays cores with
for finer casting finish

To find a product that would produce a high surface hardness on their cores and give a better casting finish, the Lynchburg Foundry Company tested many different products. After exhaustive tests on a wide variety of cores they found that MEXACOTE would do exactly what they wanted it to do. Say Lynchburg engineers: "Now we spray all cores — where spraying is possible—with a 15° Baume' solution of MEXACOTE and the results have been highly satisfactory."



From core to casting. The picture at left shows one part of the core assembly for clutch housing after having been sprayed green with Mexacote and baked. At right is the casting. Note fine finish that will require minimum finishing.

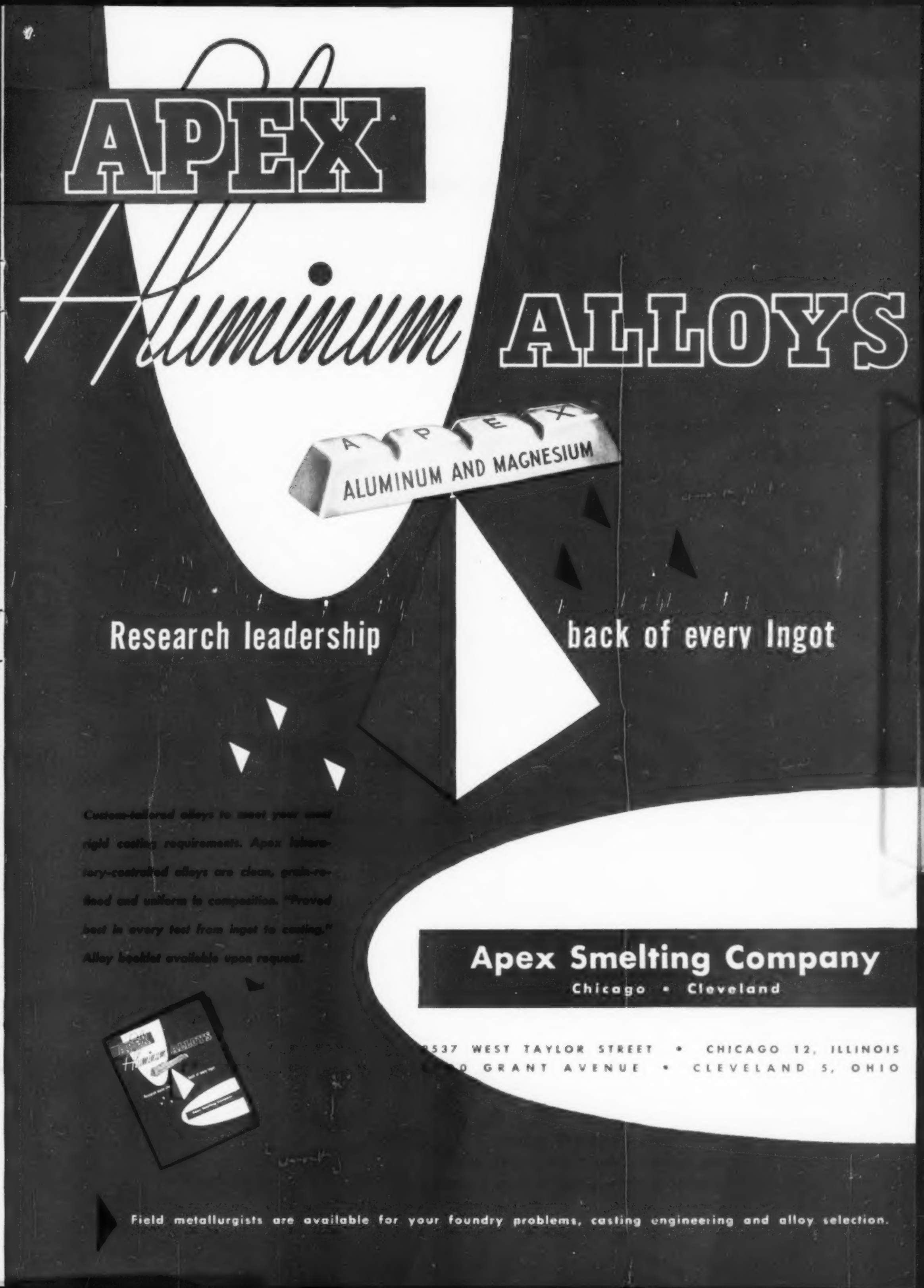
When you want a better casting finish, spray or dip molds and cores with MEXACOTE. It quickly mixes with water and thins to a spraying consistency. MEXACOTE forms a firm coating that will not crack, shrink, scab, peel or buckle under heat, and can be dried by torch, lamp, or oven. A solution of 20° Baume' is usually recommended for spraying, 35° for dipping. MEXACOTE holds true core dimensions, does not run or build up — penetrates sand to prevent burning in. Write for special MEXACOTE bulletin.



At left, resin cores for part of truck transmission case are sprayed green with Mexacote. At right is the transmission case after casting. Note absence of veining of cored surfaces.

mexacote

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN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Completely mechanized sand preparation. The new Royer moves into the sand heap on its own power . . . scoops up sand . . . combs . . . blends . . . aerates . . . and discharges it all ready for use in molding. Trash, burnt cores, hard lumps, etc., are removed *automatically*. Finished sand is finely granulated and light in texture . . . to produce flawless castings. Up to 50 tons per hour. Foundries with the new Self-Loading Royer are getting appreciable savings on their sand preparation costs. Write for full details.
WRITE FOR BULLETIN telling how a Royer can help you cut costs and improve castings. There's a Royer Sand Conditioner for every sized foundry.
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Model NDP 20 to 25 tons per hour
Model NRS 40 to 50 tons per hour
Model NDC Combination 20 to 25 tons per hour
Model RC Combination 40 to 50 tons per hour
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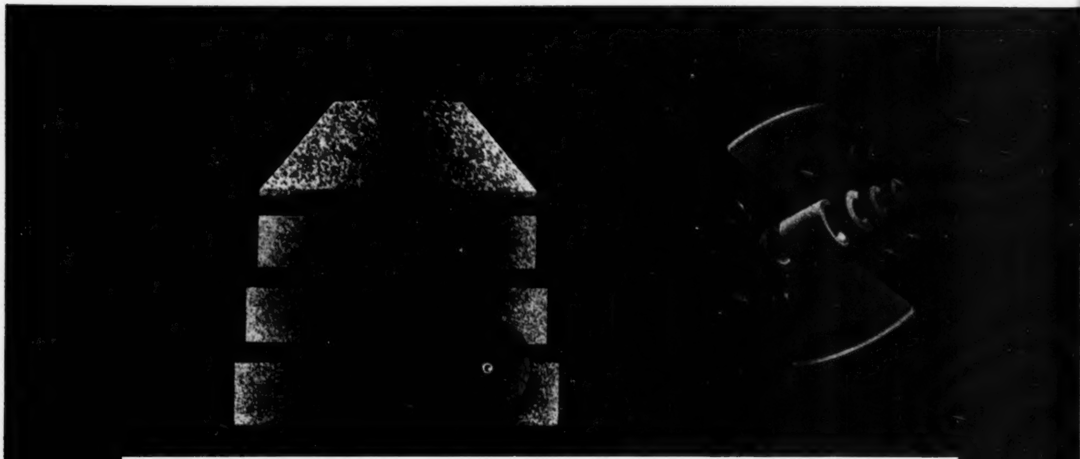
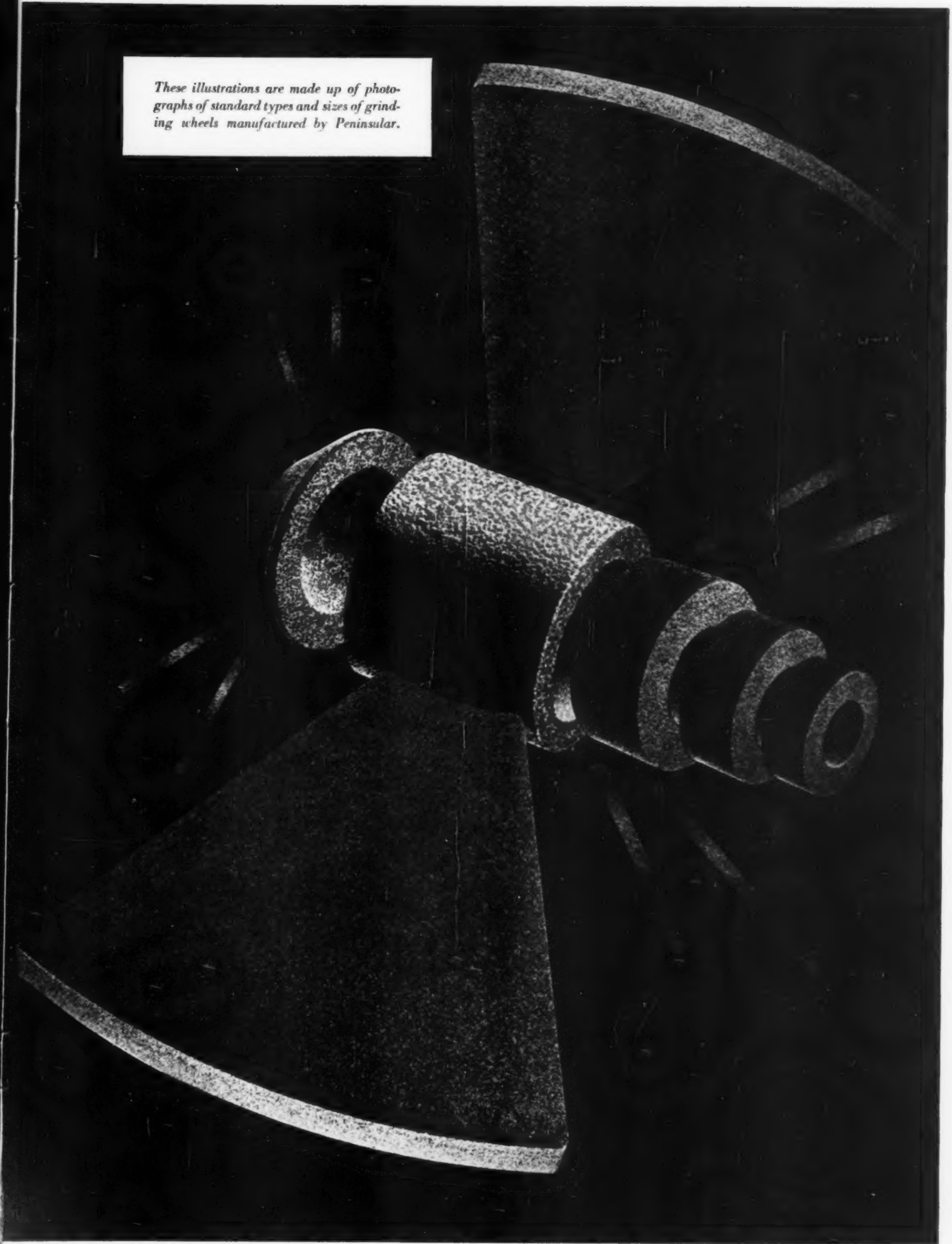
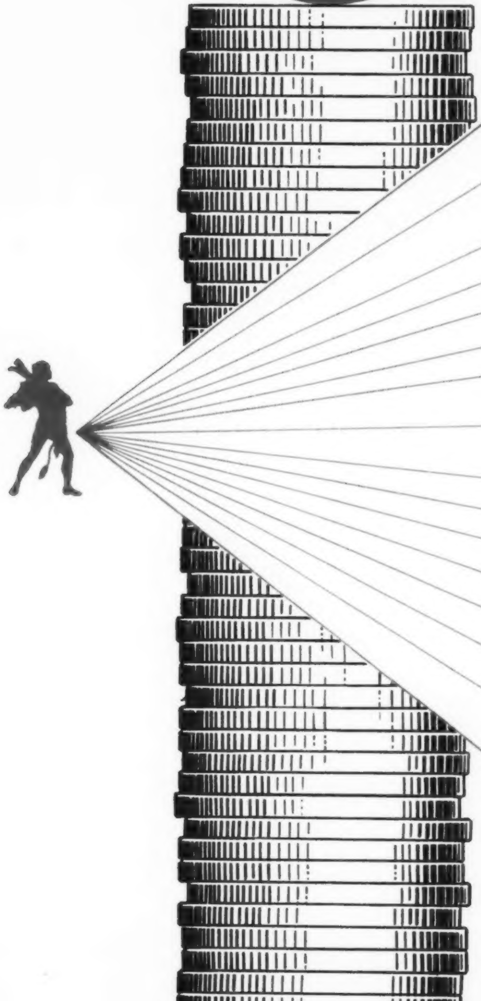




These illustrations are made up of photographs of standard types and sizes of grinding wheels manufactured by Peninsular.

Hercules TRULINE BINDER Cuts Core Room Losses



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MAKES MORE UNIFORM CORES
GIVES SAME PHYSICAL PROPERTIES
UP TO 25% FASTER BAKING
SOUNDER, TRUER CASTINGS

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using Pitch-compound Mixes...

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GIVES STRONGER-HANDLING CORES
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FEWER CRACKED CASTINGS
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Producing Thin Section

1 Adding FERROCARBO Briquettes to cupola charge. Processed and packaged for handling ease, the addition of the briquettes is a simple operation.

2 Iron flowing from cupola to air furnace. FERROCARBO Briquettes are a widely accepted agent for obtaining thorough deoxidation.

Malleable Iron Castings

A fluid iron is required to obtain optimum results in producing thin section malleable castings. When FERROCARBO silicon carbide Briquettes are used in the cupola charge, fluidity is prolonged. Product performance is improved. Scrap loss is reduced. Castings, like the ones illustrated here, are the result.

Because of this experience, considerable attention is being directed to the use of FERROCARBO Briquettes in malleable operations. Complete details can be obtained from our metallurgists.

FERROCARBO Briquettes

BY CARBORUNDUM

TRADE MARK

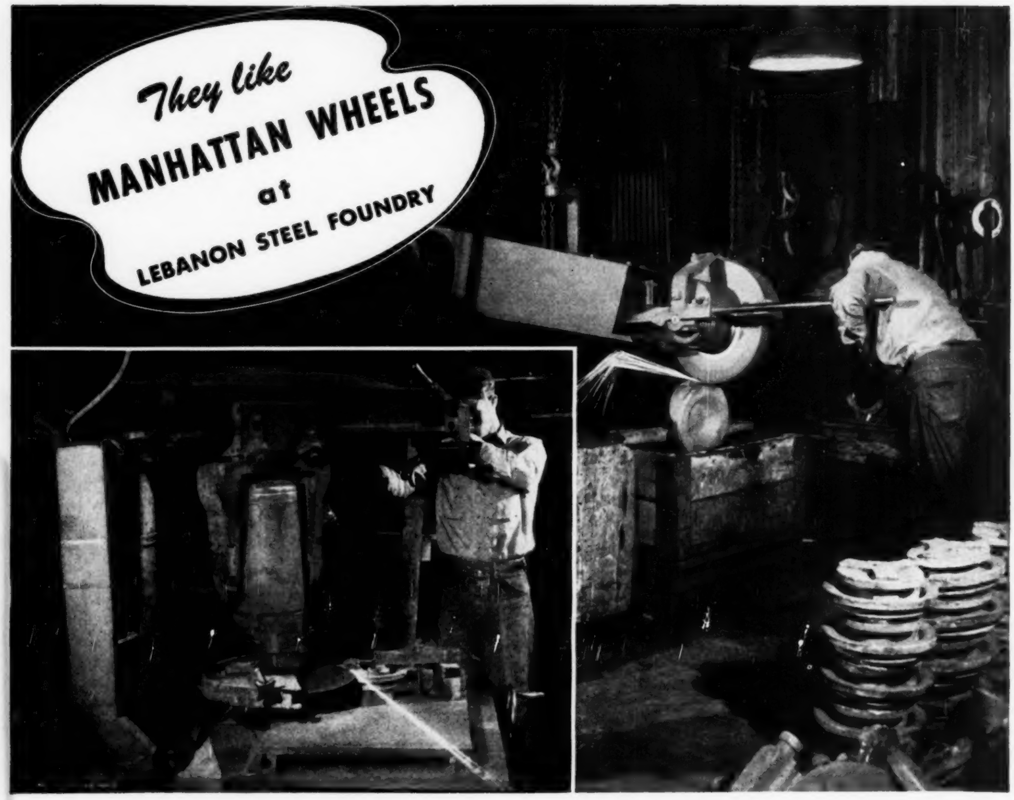
THE CARBORUNDUM COMPANY, Bonded Products and Abrasive Grain Division, Niagara Falls, New York

FERROCARBO Distributors: Kerchner, Marshall & Co., Pittsburgh, Cleveland, Birmingham, Philadelphia and Buffalo; Miller and Company, Chicago, St. Louis and Cincinnati

"Carborundum" and "Ferrocarbo" are registered trademarks which indicate manufacture by The Carborundum Company

3 **Tapping air furnace.** FERROCARBO Briquettes provide prolonged increases in fluidity.

4 **Pouring a casting.** There are less shrinkage cracks and hot tears close to or where risers feed castings.



CUT-OFF WHEELS
for Hard and Soft Cutting

Shown here is one of Lebanon's new DeWalt Cut-Off machines which moves into the work either horizontally or vertically. A Manhattan 18" Cut-Off Wheel is making a cool, quick cut on a foundry cast suction head for a chemical pump. Cool cutting is important here where overheating would burn and check the metal surface. This particular metal is Lebanon's "Circle L" #33, 19% chrome and 24% nickel, with some copper content.

One of these modern machines uses anywhere from 10 to 40 wheels per day depending on the alloy and size of the gates and risers being cut.

Manhattan Cut-Off Wheels are used in two specifications for hard and soft cutting. They last longer and cut better than anything tested to date.

SNAGGING WHEELS
for Swing Frames and Stand Grinders

Lebanon Steel Foundry has some of the most modern equipment to speed their expanding foundry operations. Shown here is one of their new Fox High Speed Swing Frame Grinders. A 20" x 2½" x 6" Manhattan Snagging Wheel runs at a peripheral speed of 9,000 feet per minute on this grinder, driven by a 1750 RPM motor.

Manhattan 24" x 3" x 12" Snagging Wheels are used on the Stand Grinders in Lebanon Steel Foundry's efficient layout.

Tests are run periodically to check wheel performance on all grinders. To meet Lebanon's standards of production and keep costs in line, Manhattan Wheels have to maintain a consistent record of highest output per man hour.

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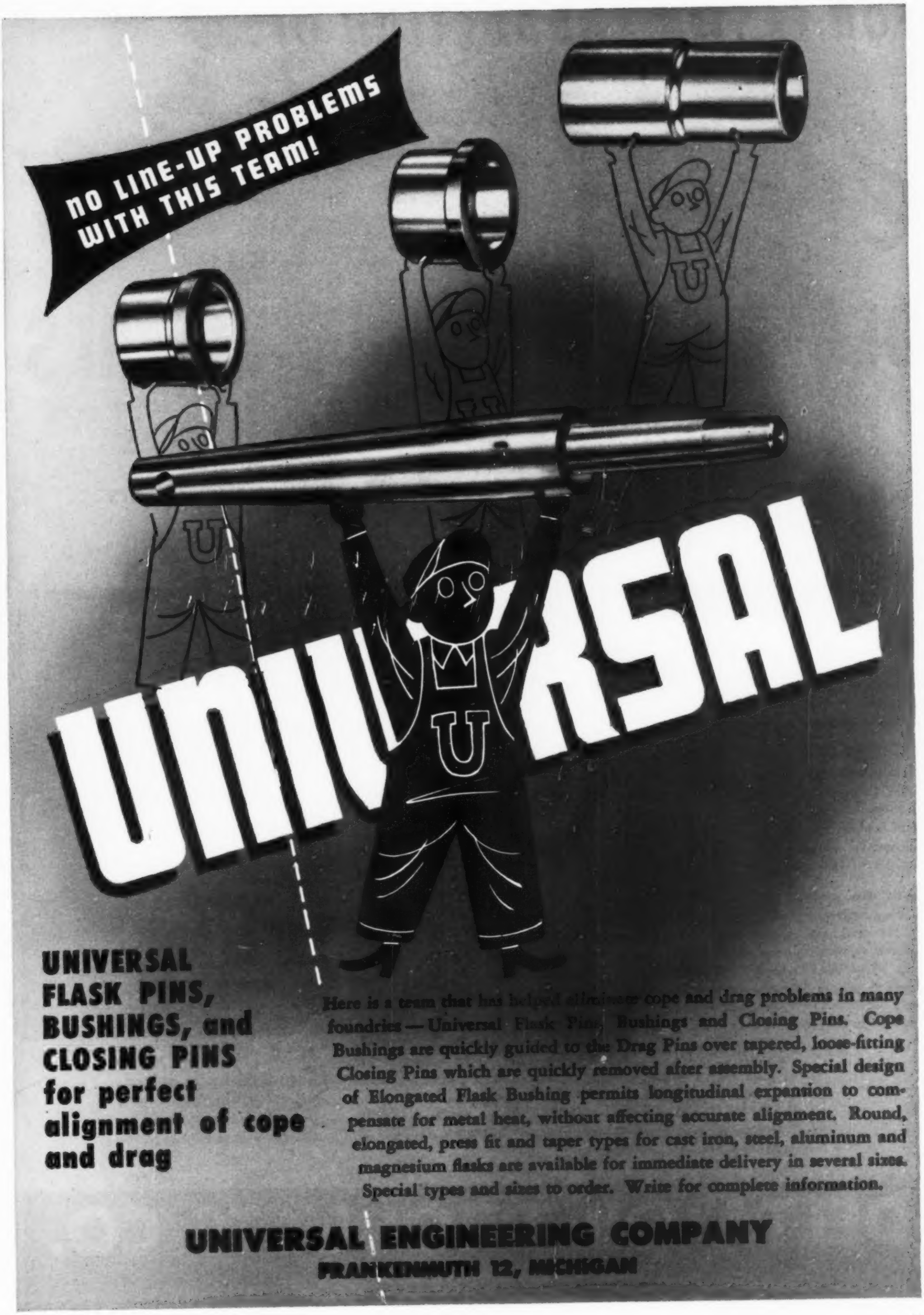
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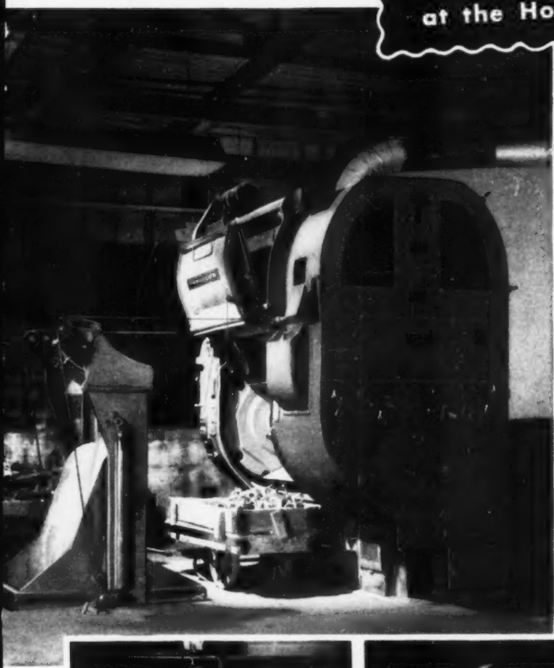
UNIVERSAL FLASK PINS, BUSHINGS, and CLOSING PINS for perfect alignment of cope and drag
Here is a team that has helped eliminate cope and drag problems in many foundries — Universal Flask Pins, Bushings and Closing Pins. Cope Bushings are quickly guided to the Drag Pins over tapered, loose-fitting Closing Pins which are quickly removed after assembly. Special design of Elongated Flask Bushing permits longitudinal expantion to compensate for metal heat, without affecting accurate alignment. Round, elongated, press fit and taper types for cast iron, steel, aluminum and magnesium flasks are available for immediate delivery in several sizes. Special types and sizes to order. Write for complete information.
UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 12, MICHIGAN

Eight years of continuous use proves ROTOBLAST* cleans faster ... better ... cheaper!

at the Homer Furnace and Stove Co.

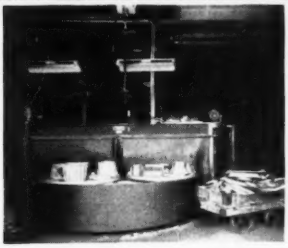


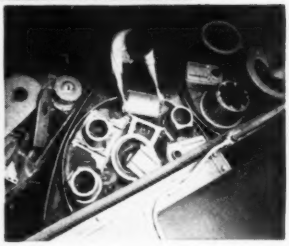
PRODUCTION SOARED as soon as this 14 cubic foot ROTOBLAST Barrel was installed at Homer Furnace and Stove Co. in 1941! Blast cleaning costs were reduced to rock bottom . . . and castings were completely cleaned . . . even those with hard-to-reach pockets!

Two years later Homer added a 14 foot diameter Pangborn ROTOBLAST Table to their cleaning equipment. The ROTOBLAST barrel-and-table team drove production figures *even higher!* Gave the company high-quality blast cleaning at low cost on all their castings!

Pangborn ROTOBLAST saves money for hundreds of users like Homer Furnace and Stove Co. Find out how it can do the same for you! General details are given below . . . but for *specific information* fill in the handy coupon and mail today!

Pangborn *ROTOBLAST cleans most effectively at lowest cost per hour of operation! It directs all the abrasive on a given target with the highest velocity for a given peripheral speed.* ***Cleans faster*** *because it throws greater volume of abrasive, covers a larger area with greater density!* ***Cleans better*** *because it produces a finer surface than old-style methods!* ***Cleans cheaper*** *because it requires less horsepower to propel abrasive, uses less manpower, minimizes maintenance, eliminates air compressor investments! Send coupon for full information today.*





This ROTOBLAST Table cleans all sizes of castings quickly and cheaply . . . Teams up with Barrels to boost Homer's casting output!

MORE THAN 25,000 PANGBORN MACHINES SERVING INDUSTRY

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COMPANY ....
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CITY .... ZONE ..... STATE .....

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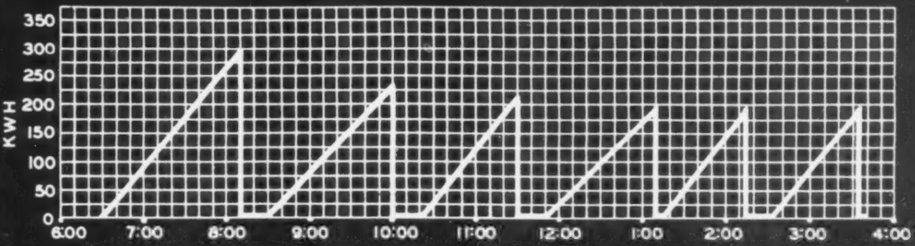
BLAST CLEANS CHEAPER with the right equipment for every job

DETROIT ROCKING ELECTRIC FURNACE



NOTES ON DAILY OPERATION OF TYPE LFY, 700-LB. CAPACITY DETROIT ELECTRIC FURNACES MELTING NICKEL:

TOTAL HOURS OPERATION—9¼ hrs.; NUMBER OF HEATS—6; WEIGHT PER HEAT—900 Lbs.; TOTAL METAL MELTED—5450 Lbs.; TOTAL KILOWATT HOURS—1323; KILOWATT HOURS PER TON—486.

PROFITS FROM DETROIT ELECTRIC FURNACE OPERATION IN PAST YEAR: $150,000.00.

NOTES ON TWO-YEAR OPERATION OF SAME FURNACES:

COMPANY—A Well-Known Automotive Plant (name on request); PERIOD—(Sept. 9, 1946 to Sept. 18, 1948); TOTAL TONNAGE MELTED—1,070; AVG. ELECTRODE USAGE—8.65 Lbs. per Ton of Nickel at .23/Lb.—$1.99; AVG. POWER CONSUMPTION—625 KWH/Ton at 1¼c—$7.81; AVG. REFRACTORY COST—$4.00/Ton.

AVG. TOTAL MELTING COST OVER TWO YEARS: $13.80 PER TON.

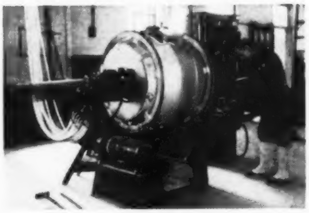
Maximum QUALITY CONTROL • *Low* MELTING COST

FOR FERROUS AND NON-FERROUS METALS

This record is typical of annual savings obtained with Detroit Rocking Electric Furnaces. An important additional advantage is the fine degree of quality control obtained in every melt.

Other economical features are: optimum power use and all-electric operation eliminating handling and storing of messy, bulky fuels; positive control of melting speed, quality and composition; exact duplication of previous melts; and control of other melting factors. Out-of-production time is minimal. Burned-out linings are quickly, easily replaced by spare, previously-lined furnace shells.

Fast, always uniform outputs and low metal losses by shrinkage save production time, labor and expense. Shop borings, turnings and scraps are reduced with least loss from oxidation.



The electric arc is automatically established clear of the molten bath at all times. The metal never becomes a part of the electric circuit. This method assures uniform temperatures within the melting chamber.

Detroit Rocking Electric Furnaces are available with automatic electrode control and automatic rocking control. There is a wide range of sizes to choose from . . . from 10 to 4000-lb. capacities. Chambers are of conical or cylindrical type. All furnaces are individually designed to meet your plant electrical specifications.

Let our engineers send you all the facts on how you reduce melting costs the year around, with the Detroit Rocking Electric Furnace. Send us your pertinent production data and we will show you the ultimate in operating economy and positive quality control with the Detroit Rocking Electric Furnace suited to your requirements in size, use and capacity. Write:

DETROIT ELECTRIC FURNACE DIVISION

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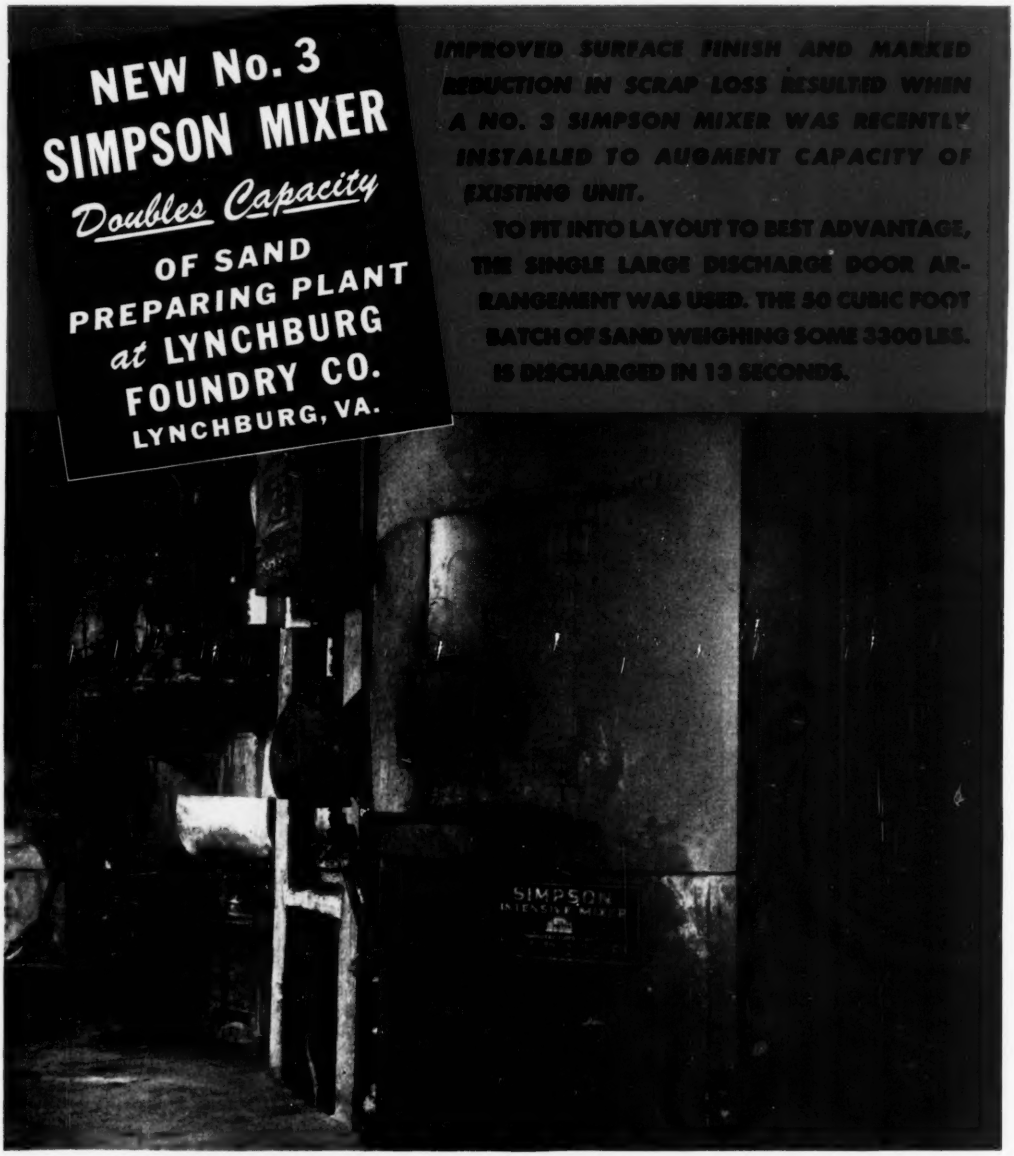
Foreign Representatives: In Brazil—Euipamentos Industrias "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi, Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Casco, S. de R. L. Atenas 32 - Despacho 14, Mexico City, D. F.



SIMPSON MIXERS WILL HELP YOU TO IMPROVE YOUR PRODUCT AND REDUCE COSTS. YOUR NATIONAL ENGINEER WILL BE GLAD TO ASSIST IN PLANNING THE INSTALLATION.

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NATIONAL *Engineering Company*

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Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney, Australia

FOUNDRY *of the* FUTURE

MAJOR EFFORTS of the foundry of the near future will be devoted to the well-being of its men and more of the industry's work will be given to machines.

Some of our foundries are as neat and sanitary as bakeries and as pleasant to work in, and more are achieving this goal. Continued progress is essential and increasing numbers of foundries are taking advantage of the new developments in foundry planning and mechanization which make them *better* places to work.

Startling improvements* in molding, core making, charging, pouring, jacketing, clamping, shakeout and cleaning have been made, accompanied by better lighting and ventilation.

The trend toward automatic molding and core blowing shows promise of developing a fluid sand as a molding medium that is quick drying, refractory and, when necessary, collapsible. The permanent mold machines, using metal dies for molds, represent the application of automatic molding in which the rigid metallic die occupies the place which the fluid refractory mold will some day hold.

Melting and furnace practices will undoubtedly move more and more toward complete instrumentation for quality control. Further mechanization of charging and pouring operations, and short-cut fluxing and deoxidizing treatments may confidently be expected. The cupola, with improvements in auxiliary equipment, will continue to be the most economical melting unit for the gray iron foundryman.

Steel and non-ferrous operations will continue moving toward electric furnace melting, while gray iron and malleable foundrymen will employ such equipment mainly in connection with finishing operations.

*See "Products Parade"—an Exhibit on Paper—in the April, May and June issues of AMERICAN FOUNDRYMAN.

Fast melting in the brass and bronze foundry by means of induction furnaces, indirect-arc furnaces and improved gas and oil fired furnaces have practically replaced the old coke fired equipment.

Extensive metallurgical advances over the past few years show promise of continuing. Oxidation, deoxidation, degassing, grain size control and heat treatment represent some of the processing operations that will lead to greater foundry achievements and better castings. Alloying elements such as the lesser known alkaline earths are again up for research, while the improvements in foundry products obtained with calcium, boron, cerium, magnesium, berylium, selenium, tellurium and others continue to be reported.

As the foundries of the future continue to recognize the value of friendly cooperation, competition between types of castings will become less noticeable.

Opportunity for free exchange of technical and operating information must be available to all, and used by all. Undoubtedly, the American Foundrymen's Society comes closest to providing such a common meeting ground for technical information.

Many other organizations now serve various phases of the industry, but none is prepared to deal with the industry's over-all problems. Lacking some means to meet these over-all problems, as through a "United Nation of Foundrymen," the foundry of the future will find it difficult to realize to the fullest extent its potentialities as a faithful servant of civilization.

J. S. Vanick

J. S. VANICK

Chairmanship of the A. F. S. Gray Iron Research Committee is the latest Society activity of James Sebold Vanick. Active in A. F. S. work since joining the organization in 1923, he has participated in many Gray Iron Division projects, has been a member of the Cast Metals Handbook Committee and is vice-chairman of the Division's Program and Papers Committee. Other activities include membership on a joint technical societies committee on heat treatment terms and a directorship in the A. F. S. Metropolitan Chapter which he represents in the technical society councils of New York and of New Jersey. Metallurgist for International Nickel Co., New York, Mr. Vanick is a pioneer investigator in nickel alloyed cast irons and is the inventor of several families of high nickel cast irons. He graduated from Case Institute of Technology in 1916 with a science degree, later receiving a metallurgical engineering degree, and in 1921 he received the degree Master of Science from George Washington University. He is the author of over 50 technical papers.

AFS

53rd ANNUAL ..... Convention NEWS Story

Opening day attendants crowded the mezzanine of the Jefferson Hotel, where they registered for the Convention, for plant visitations, and where some signed the International Guests, Canadians and Old Timers Registers

. . . . CONVENTION

HEAVY TECHNICAL SESSION ATTENDANCE marked the 53rd Annual A.F.S. Convention held in St. Louis, May 2-5. With some 2500 top technical and management men at the Convention, including registrants from Canada, Mexico, France, Brazil, Denmark and Australia, most of the technical speakers had audiences numbering between 200 and 300. Attendance at the meeting on nodular graphite cast iron was over 700, largest technical meeting at any A.F.S. Convention.

Climaxing the four-day series of technical meetings, shop course sessions, plant visitations and the ladies entertainment program was the Annual Banquet, the evening of May 5. Principal speaker was the Honorable W. Stuart Symington, Secretary of the Air Force, formerly a foundryman and member of A.F.S. Preceding Mr. Symington's address A.F.S. Gold Medals and Honorary Life Memberships were presented. Announcement of the 1950 Annual A.F.S. Foundry Congress and Show—to be held in Cleveland, May 8-12—was made by President W. B. Wallis, who presided at the Banquet. During the banquet President Wallis read greetings from the Institute of British Foundrymen, the Dutch and the Polish Technical Foundry Associations and the Institute of Australian Foundrymen.

Other Convention highlights were the Annual Business Meeting, May 4, at which officers for 1949-50 were elected (see page 46 this issue) and where first place winners in the four divisions of the 26th Annual A.F.S. Apprentice Contest received $100 checks and recognition certificates (page 50). Immediately following the Annual Business Meeting, John Howe Hall, Swarthmore (Pa.) foundry con-

John Howe Hall giving the Charles Edgar Hoyt Annual Lecture

William Schneider, 75-year foundry veteran, receives service pin from 1909 A.F.S. President L. L. Anthes, a 53-year veteran

Hundreds of foundrymen registered for Convention plan visitations to 16 St. Louis area foundries.

sultant, delivered the Charles Edgar Hoyt Annual Lecture, *"Steel Castings in Welded Assemblies."*

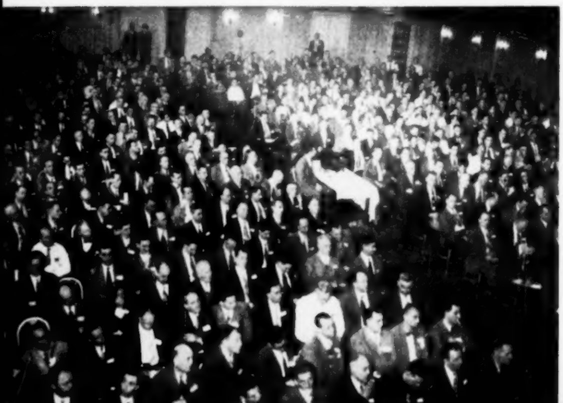
Traditional gathering of Society officers and directors, past and present, and medalists and life members, the A.F.S. Alumni Dinner, brought together 17 of 24 living past-presidents. Heading the list of distinguished foundrymen at the dinner who have held the Society's highest office was Wm. H. McFadden, Southland Royalty Co., Ft. Worth, Tex., president in 1907 and donor of the Wm. H. McFadden Gold Medal.

Of the total of 73 technical papers and discussion opportunities afforded by the technical meetings, round-table luncheons and shop course sessions, some of the best attended and most thought provoking were those including the reports on A.F.S.-sponsored research. Other popular sessions featured the official exchange papers from the Institute of Australian Foundrymen and the Institute of British Foundrymen.

Chapter Officers and Directors Meet

Throughout the Convention, the Board of Directors, some technical committees and the divisions held meetings to transact business and plan future work. Meeting with the Board on May 4 were chapter officers and directors who attended a luncheon to hear a talk by President-Elect E. W. Horlebein, Gibson & Kirk Co., Baltimore, Md., now Vice-President of the Society.

The symposium on production of nodular graphite cast iron, featuring nationally prominent metallurgists, drew over 700 foundrymen – largest audience ever to attend a Convention technical session.



Metallography of the light metal alloys was the theme of the opening aluminum and magnesium session the morning of May 2. Speakers were A. M. Montgomery, Aluminum Company of America, Cleveland, talking on *"Metallography of Aluminum Casting Alloys,"* and P. F. George, Dow Chemical Co., Midland, Mich., who presented a paper entitled *"Metallography of Cast Magnesium Alloys."* Presiding were A. W. Stolzenburg, Aluminum Company of America, Detroit and T. E. Kramer, Acme Aluminum Alloys, Inc., Dayton, Ohio.

Mr. Montgomery described selection of metallographic specimens and polishing and etching techniques which enable a trained metallographist to determine such factors as: method of casting, type of alloy, type and extent of heat treatment, grain size, presence of voids, inclusions or segregation, type and thickness of surface coatings, type and extent of corrosion, or type of fracture in a casting failure.

In the second paper, Mr. George outlined metallographic techniques for magnesium casting alloys including grinding and polishing, composition of etchants and specimen etching techniques. As in the preceding paper, microconstituents and microstructures were brought out with numerous slides.

The brass and bronze program of the 1949 Convention started Monday, May 2, at 10:00 a.m. with three

A. W. Silvester, chief metallurgist, Russell Manufacturing Co., Melbourne, Australia, presenting the Exchange Paper of the Institute of Australian Foundrymen, "Graphitization of Gray Cast Iron by Heat Treatment," at a well-attended session.

papers. Presiding was President-Elect E. W. Horlebein, Gibson & Kirk Co., Baltimore, Md. *"Casting Finish,"* the first paper was presented by H. H. Fairfield, Wm. Kennedy & Sons, Ltd., Owen Sound, Ont. Co-author of the paper is J. MacConachie of the same company.

Mr. Fairfield described a method for investigating the basic factors affecting smoothness of castings in which small test castings were buffed smooth, the loss in weight being the index of smoothness. The authors showed that high temperature and high moisture increase casting roughness.

Second paper was *"Effects of Melting Atmosphere, Time at Temperature and Degasification on Properties of Valve Bronze,"* by W. H. Baer and B. M. Loring, Naval Research Laboratories, Washington, D. C. In presenting the paper, Mr. Baer explained experiments

in induction melting of valve bronze which showed that normal density and tensile properties are achieved when the metal is exposed to air and that holding as long as 15 minutes has no appreciable effect on mechanical properties.

Melting under dry charcoal and wet charcoal was also done with less favorable results, the worst melting condition being with wet charcoal. The latter condition was significantly improved when the melt was treated with dry nitrogen.

Speaking on *"Practical Melting and Its Relation to Gases in Metal,"* O. E. Decker, Acheson Manufacturing Co., Pittsburgh, listed practical suggestions for melting copper-base alloys in natural gas fired crucible furnaces. He recommended one size of crucible to a furnace and emphasized the importance of adequate furnace maintenance. Fast melting and immediate pouring, clean crucibles and clean scrap are important, he said. The basic charge should consist of ingot metal wherever possible he concluded.

A.F.S. National Secretary-Treasurer, Wm. W. Maloney announcing the election of 1949-50 officers and directors of the Society at the Annual Business Meeting on the afternoon of May 4.

The first of the Malleable Division meetings, held at 10:00 a.m., Monday, May 2, featured a paper by J. E. Rehder of the Canadian Bureau of Mines and a progress report on the Malleable Division Research Project by S. H. Bush, W. P. Wood and F. B. Rote of the University of Michigan.

Apply Theory to Annealing Practice

Speaking on *"Effects of Temperature and Silicon Content on First-Stage Annealing of Blackheart Malleable Iron,"* Mr. Rehder stated that his experiments have shown that the plotting of the logarithm of the silicon content versus the logarithm of the first-stage annealing time produces a straight line, whose slope depends upon the carbon content of the iron. He added that the data also falls on straight parallel lines when plotted as a logarithm of time vs. temperature; and the slope of these lines when temperature is plotted as the inverse of absolute temperature is found to be −10,950. Mr. Rehder concluded by discussing the application of this principle to commercial practice.

Fitz Coghlin, Jr., Albion Malleable Iron Co., presented a series of slides showing how Mr. Rehder's theories were borne out by tests at the Albion Malleable Iron Co., Albion, Mich.

The Reception Tea, held the afternoon of May 2 at the Chase Hotel's Starlight Roof, opened the entertainment program for lady guests of the Convention.

Reporting on the *"Surface Hardening of Pearlitic Malleable Iron,"* S. H. Bush spoke on investigations being carried out at the University of Michigan on malleable irons in current commercial use.

Malleable Research Project Results

In these investigations, several foundries have contributed test bars covering a wide range of chemical compositions, heat treatment and melting practice, Mr. Bush said. Each of these foundries furnished 100 test bars in the white iron and heat treated condition. The project's investigators are studying quenching media, and variables in times and rates of heating. A complete study of hardness vs. microstructure is being made on every possible combination of conditions.

According to Mr. Bush, sufficient progress has been made on the project to indicate its feasibility, and the work is expected to contribute considerably to the development of specifications for localized hardening.

J. A. Durr, Albion Malleable Iron Co., presided over

French foundrymen R. Boutigny (left), Stein & Roubaix, Paris, and Pierre Daugenet (center), Founderie des Ardennes, Pont Audemer, Eure, are welcomed to the Convention by A.F.S. President-Elect Horlebein.

the session, with H. L. Day, Auto Specialities Mfg. Co., St. Joseph, Mich., as co-chairman.

"Fluid Flow in Transparent Molds," a progress report on the A.F.S. Aluminum and Magnesium Research Project, attracted many foundrymen not primarily interested in light metals to the aluminum and magnesium round table luncheon the first day of the Convention. Prepared by R. E. Swift, J. H. Jackson and L. W. Eastwood, Battelle Memorial Institute, Columbus, Ohio, the report was in the form of a motion picture showing fluid in various shaped sprues and gates. An unusual factor in the entrapment of air was the visual demonstration of negative pressures developed in some types of sprues which result in air being drawn into the metal through the mold.

Suggest Principles for Gating

Recommendations coming out of the work to date are: (1) A pouring box is mandatory; (2) First liquid should not be allowed to enter the mold cavity; (3) A removable or fusible plug should be used to facili-

Recipients of Honorary Life Memberships in the American Foundrymen's Society and prominent foundrymen who presented them with their certificates at the Annual Banquet climaxing the 53rd A.F.S. Convention are, top, left to right, C. R. Culling, Carondelet Foundry Co., St. Louis, and Ralph L. Lee, Grede Foundries, Inc., Milwaukee, recipient; (upper center), left, A.F.S. Past National President Ralph J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich., and Anthony J. Haswell, Dayton Malleable Iron Co., Dayton, Ohio, recipient; (lower center), left, Dean Clement J. Freund of the College of Engineering, Detroit University, recipient, and Harold S. Falk, The Falk Corp., Milwaukee; (bottom) left, A.F.S. Past National President Herbert S. Simpson, National Engineering Co., Chicago, and A.F.S. President W. B. Wallis, recipient.

tate rapid filling of the pouring box. Work of the immediate future will include continuation of the study of gating systems for castings having relatively small vertical dimensions but substantial lateral dimensions.

Supplementing the film was a running commentary by Dr. Eastwood. R. F. Thomson, International Nickel Co., Detroit, and W. E. Sicha, Aluminum Company of America, Cleveland, chairman and vice-chairman, respectively, of the Aluminum and Magnesium Research Committee, presided at the session.

Melting problems were the subject of the second brass and bronze session, May 2, when D. C. Caudron, Pacific Brass Foundry, San Francisco, spoke on *"Gas Fired Melting of Copper Base Alloys in A Reducing Atmosphere,"* and M. G. Dietl, Crane Co., Chicago, discussed *"The Problem of Gases in the Indirect Arc Furnace."* Presiding were H. J. Roast, Montreal, Que., and W. Romanoff, H. Kramer & Co., Chicago.

Describing an unusual deviation from foundry melting practice, Mr. Caudron explained a successful method of melting copper-base alloys under a reducing atmosphere and subsequently blowing compressed air through the melt for hydrogen removal. Standard deoxidation treatment with phosphor copper follows. Advantages mentioned include minimum contamina-

tion of mutually incompatible alloys through slag build-up, lower melting loss and wider permissible range for combustion mixtures.

Gassed metal is not characteristic of the indirect-arc furnace, Mr. Dietl said in describing his practice, but is the result of outside influences. He outlined correct furnace practice and gave as outside influences detrimental to metal quality: water in the charge or the furnace lining, sulphur or carbon which may give off gaseous reaction products in the metal, and nascent carbon (liberated by a dirty, smoky arc) slightly soluble in red brass.

In a normally operated furnace no apparent benefit is gained by blowing a stream of air into the furnace, he said. Brasses containing considerable zinc and phosphorus may be swept with an inert gas such as nitrogen to lower the hydrogen concentration of the melt and reduce the possibility of gassed metal, he concluded.

Attended by a capacity crowd of 125 foundrymen, the May 2, 2:00 p.m., malleable iron session had as its chairman, W. D. McMillan, International Harvester Co., Chicago, with R. P. Schauss, Illinois Clay Products Co., Chicago, as co-chairman.

First speaker of the session was H. N. Bogart, co-author with Gosta Vennerholm, both of Ford Motor Co., Dearborn, Mich., of *"Influence of Type of Slag on Heat Treatment Susceptibility of Malleable Iron."*

Control Malleable Melting Slag

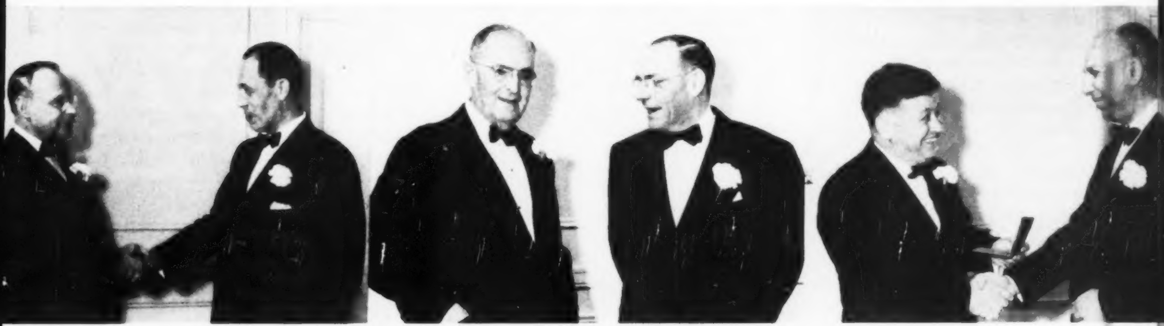
Mr. Bogart described the experiences of the Ford Motor Co. in using straight electric furnace melting for the production of malleable. Using 15-ton electric furnaces as a source of molten metal during the war, the company found that the melting furnace slag type influences the susceptibility to malleabilization.

It was found, Mr. Bogart said, that optimum susceptibility to heat treatment could be obtained by finishing all the electric furnace heats under slags containing less than 18 per cent FeO, which was controlled by additions of lime to the bath. On the basis of these discoveries, the speaker said, the process specifications covering melting of white iron for malleable at the author's company, were modified to include slag control in cases of electric furnace melting.

Believe Slow Heating Overemphasized

The second paper, *"Influence of Heating Rate on First-Stage Graphitization of White Cast Iron,"* by R. Schneidewind, University of Michigan, and D. J. Reese, International Nickel Co., New York, was presented by Prof. Schneidewind.

The speaker described the annealing at 1700 F of step bars poured from the same heat. The rates of heating to 1700 F were 6500, 350, and 150 F per hour, respectively, between temperatures of 1200 and 1700 F.



Three A.F.S. Past National Presidents who presented Gold Medals of the Society at the Annual Banquet climaxing the 53rd Convention are shown here with the 1949 medalists. Left to right are: Past President Fred J. Walls, International Nickel Co., New York, and Wm. H. McFadden Gold Medalist Gosta Vennerholm, Ford Motor Co., Dearborn, Mich.; Past President S. V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis, and Peter L. Simpson Gold Medalist Russell J. Anderson, Belle City Malleable Iron Co., Racine, Wis.; and Past President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., and John H. Whiting Gold Medalist S. C. Massari, Technical Director of the American Foundrymen's Society, Chicago.

It was found, Mr. Schneidewind said, that the time necessary to complete first-stage graphitization decreased. Preheating at 800 F, Mr. Schneidewind concluded, showed increase in annealing velocity, but a proportional increase in time for heating to the soaking temperature would seem to be better.

A written discussion of the paper was given by J. E. Rehder of the Canadian Bureau of Mines, Ottawa, in which he said that the discussion of effects of heating rate and of holding at sub-critical temperature corroborated his opinion that the effect of slow heating rates or sub-critical holding on total first stage annealing time has been overemphasized from the practical viewpoint for a long time.

The 4:00 p.m. malleable session was under the chairmanship of C. F. Joseph, Central Foundry Division, General Motors Corp., Saginaw, Mich., with C. F. Lauenstein, Link-Belt Co., Indianapolis, as co-chairman.

The first paper, *"Some Effects of Deoxidation Treatments on Graphitization of White Cast Iron,"* was presented by R. W. Heine of the University of Wisconsin. Prof. Heine presented a study of deoxidation effects on inclusions showing that eutectic sulphide inclusions

similar to those found in cast steels were produced when the point of complete deoxidation was reached.

The quantity of graphite nodules developed during first-stage graphitization, Prof. Heine said, decreases initially with small deoxidizing additions and then increases rapidly as complete deoxidation is attained with the formation of a floccular instead of a nodular type graphite. He concluded by stating that the time required for first-stage graphitization is considerably reduced by deoxidation.

Studies First-Stage Annealing

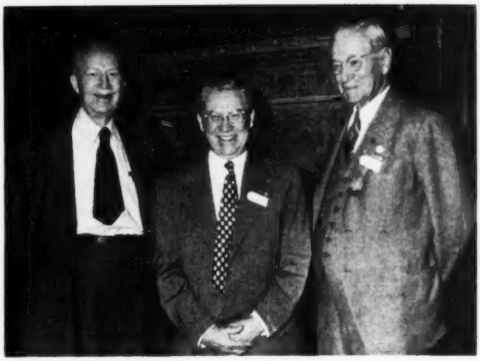
The second paper of the session, *"Influence of Silicon Content on Critical Temperature Range During Slow Cooling of Blackheart Malleable Iron,"* was presented by J. E. Rehder of the Canadian Bureau of Mines, Ottawa, Ont., Canada.

Mr. Rehder told of experiments in which a series of white cast iron bars were made up from a pig iron and steel charge, whose carbon content was approximately 2.25 and whose silicon content varied from 0.76 to 1.57 per cent. When first-stage annealing was completed, the limits of critical temperature range were determined. It was found, the speaker said, that the upper limit rises uniformly as silicon content increases, and that the lower limit rises more slowly and irregularly.

Austenite, ferrite and graphite co-exist within the range in apparent equilibrium, Mr. Rehder said. The speaker concluded his address by citing some practical commercial applications of these findings.

First report on the A.F.S.-sponsored Brass and Bronze Research Project was a feature of the third brass and bronze session. Prepared by J. P. Ewing, C. Upthegrove and F. B. Rote, all of the University of Michigan, Ann Arbor, the report, *"Melt Quality and Fracture Characteristics of 85-5-5-5 Red Brass,"* was delivered by Mr. Ewing. H. M. St. John, Crane Co., Chicago, and B. M. Loring, Naval Research Laboratories, Washington, D. C., were chairman and co-chairman.

First paper was on *"Graphite Resistor Furnace Melting Practice,"* by B. N. Ames and N. A. Kahn, New York Naval Shipyard, Brooklyn, with Mr. Ames making the presentation. He outlined the needs of naval repair ships for a versatile melting unit able to melt all types of alloys for emergency replacement castings. To meet these needs the Bureau of Ships sponsored development of a rocking-type two-phase graphite resistor furnace.



Long prominent in the development of the American Foundrymen's Society are these three members of the A.F.S. Alumni, photographed at the Annual Alumni Dinner, held this year at the Missouri Athletic Club, St. Louis. Left to right: L. L. Anthes, Anthes-Imperial, Ltd., Toronto, Ont., A.F.S. National President in 1909; C. E. Hoyt, Alumni Secretary and retired A.F.S. Executive Vice-President; and Wm. H. McFadden, Southland Royalty Co., Fort Worth, Texas, who was National President of the Society in 1907.

Furnaces of the type developed are used for melting tin bronzes, manganese bronze, monel, cast iron and steel and from an overall cost point of view compare favorably with other types of melting equipment. Low melting losses characteristic of the unit are due to the predominantly carbon monoxide atmosphere generated by the combustion of the resistors and the even distribution of heat in the furnace barrel.

Brass and Bronze Research Reported

Tests reported on the Brass and Bronze Research Project indicate that tensile bar fracture can be correlated against bar density and that the correlation is largely independent of furnace atmosphere or pouring temperature. Data collected includes color photo-

At a meeting of the Centrifugal Casting Committee of the Aluminum and Magnesium Division, held May 2, were, left to right: E. J. Basch, Doehler-Jarvis Corp., New York; J. W. Meier, Canadian Bureau of Mines, Ottawa; David Basch, Almin, Ltd., Schnectady, N. Y.; Walter Bonsack, Apex Smelting Co., Cleveland; Hiram Brown, Solar Aircraft Co., Des Moines; and J. C. De Haven, Battelle Memorial Institute, Columbus, Ohio.

graphs of fractures, microradiographs of tensile bars and photomicrographs.

"How to Interest Our Youth in the Foundry Industry" was discussed by E. E. Greene, Indianapolis Public Schools, Indianapolis, Ind., and F. B. Skeates, Link-Belt Co., Chicago, at the dinner sponsored by the Educational Division, the evening of the first day. Presiding was Director-Elect F. G. Sefing, International Nickel Co., New York, and co-chairman was A. W. Gregg, Whiting Corp., Harvey, Ill. They are chairman and co-chairman of the Educational Division.

Discuss Foundry Educational Problems

Presenting the educators' side of the problem, Mr. Greene outlined a survey conducted in Indianapolis to determine potential training problems which public vocational schools might solve and to study changes brought about through emergency war production and their bearing on future training plans. An outgrowth of the survey was the organization of a series of plant visitations for high school boys taking shop courses. The visits are expected to be continued during the coming year, he said.

Mr. Skeates, who has an outstanding record for procuring and training men, described methods used to maintain contact with schools and educators and their students. Personal calls by plant representatives with plant visitations for interested students have paid off in assuring his plant an adequate supply of skilled workers and candidates for supervisory positions, he said. He called on foundrymen to adopt a more positive attitude toward the foundry as a place to work, pointing out that unjust adverse publicity given to foundries during the war years was beginning to be believed by a few foundrymen.

A speaker at the May 5 Safety & Hygiene Session was G. E. Tubich, Michigan Department of Health. Listening are (center) A.F.S. Past National President L. C. Wilson, Reading, Pa., chairman, and Co-Chairman J. R. Allan, International Harvester Co., Chicago.

W. W. Levi, Lynchburg Foundry Co., Radford, Va., discussed *"Carbon Trends in Gray Iron"* the evening of May 2 at the first of this year's three gray iron shop course sessions. K. H. Priestley, Vassar Electroloy Products, Inc., Vassar, Mich., presided with N. L. Peukert, Carondelet Foundry Co., St. Louis, as co-chairman. Speaking on a subject with which he has had long experience, Mr. Levi outlined the factors influencing carbon content of cupola-melted iron. He brought out the significance of mechanical charging equipment in obtaining uniform weights of charged materials. A cupola is partially self-compensating, he said, in that variations in metal composition due to deviation in weights of charged metals may be automatically adjusted somewhat by differences in carbon absorption. As an example, he cited the addition of an excess of steel with a resultant lower silicon content in the charge. The metal of lower silicon would absorb an extra amount of carbon, thereby increasing the carbon equivalent and partially offsetting the shortage of silicon.

E. E. Woodliff, Foundry Sand Service Engineering Co., Detroit, led off the series of sand shop course meetings with a discussion of *"Causes of Penetration in Steel Castings."* R. H. Jacoby, The Key Co., East St. Louis, Ill., presided and L. A. Kleber, General Steel Castings Co., Granite City, Ill., was co-chairman.

Mr. Woodliff started his discussion by referring to a blackboard listing approximately 30 possible causes of penetration. During the course of the meeting he made use of extensive discussion and comment from the members of his audience to eliminate irrelevent factors. The final list included the more common causes of penetration and the audience gained interesting information from the discussion, which narrowed down the original list of penetration factors.

Report Heat Transfer Research

Latest developments in the A.F.S. Heat Transfer Research Project were reported at the Tuesday morning heat transfer session by Victor Paschkis, Columbia University, New York, who is conducting the work. Dr. Paschkis also presented a paper, *"The Foundryman and Heat Transfer,"* interpreting heat flow physics and applying it to foundry problems. The paper will appear soon in AMERICAN FOUNDRYMAN.

This year's progress report, *"Comparative Solidification Studies,"* continued the earlier work of determining the rate at which simple forms of castings of various materials should freeze. In this work, tests made with

A.F.S. National President and Mrs. W. B. Wallis were hosts at a reception held in the Jefferson Hotel, St. Louis, preceding the 53rd Annual Convention.

the heat and mass flow analyzer at Columbia University are compared with bleeding tests conducted in various foundries and laboratories.

One of the most interesting outgrowths of the research is the indication that the effect of chills is by no means as simple as was supposed, according to Dr. Paschkis, who explained that early in freezing there occurs a separation of the chill from the metal. This retards the rate of cooling.

Presiding at the session was J. B. Caine, Sawbrook Steel Castings Co., Lockland, Ohio, a member of the Heat Transfer Committee.

The Tuesday morning malleable session was under the chairmanship of Milton Tilley, National Malleable & Steel Castings Co., Cleveland, and Eric Welander, Union Malleable Iron Works, East Moline, Ill.

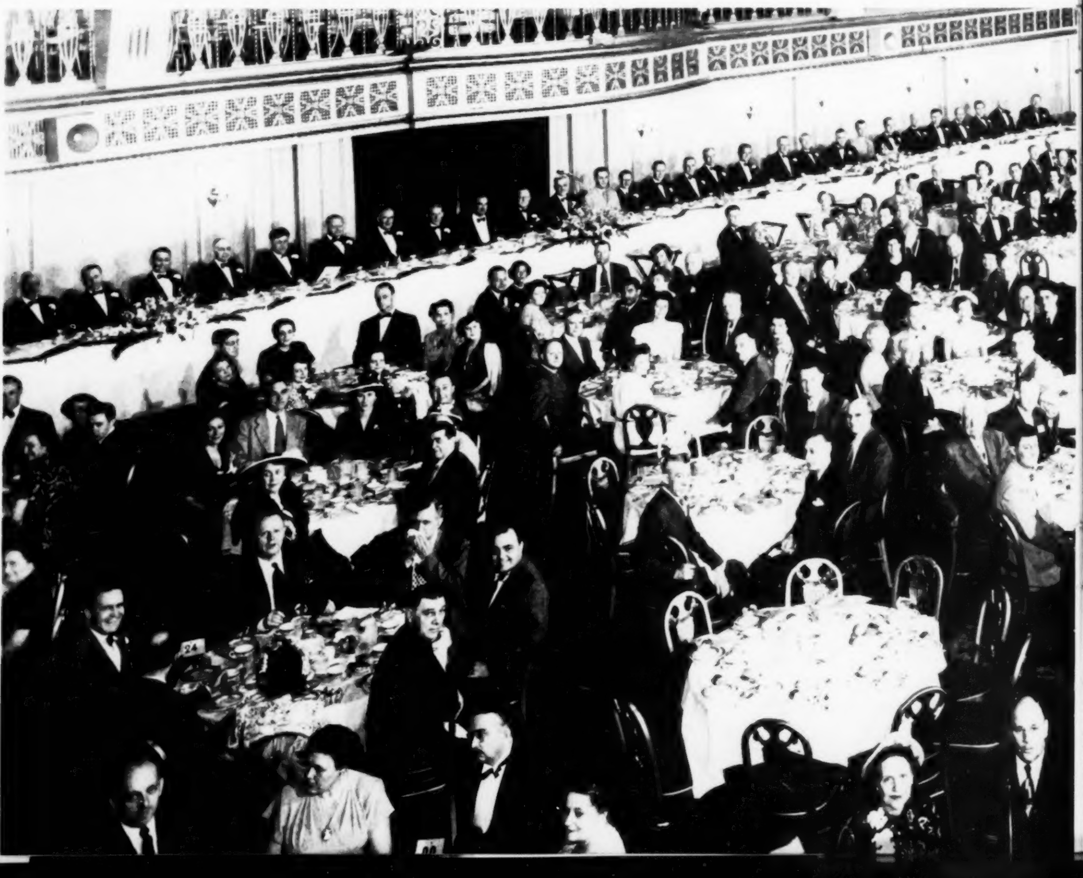
R. P. Schauss presented a report on the Malleable Division Subcommittee on Controlled Atmosphere Annealing, *"Controlled Atmosphere Annealing of Malleable Iron,"* in which he cited the results of a questionnaire sent to several malleable foundries. As a result of the survey, Mr. Schauss reported, it was found that relatively few foundries are in a position to control atmospheres in their furnaces but in terms of tonnage of malleable iron produced, atmosphere control is practiced to a marked extent.

It was also found, the speaker said, that the ratio of carbon monoxide to carbon dioxide is not important to the first stage of anneal. The presence of free-hydrogen producing gases will decrease the rate of anneal, he continued. Much work can be done on controlled atmospheres for annealing malleable iron in the future, Mr. Schauss concluded, and this is particularly true on the relation of physical properties to annealing furnace atmospheres.

The second paper of the session, *"Mechanized Foundry Maintenance,"* presented by Charles T. Luther of Central Foundry Division, General Motors Corp., described a program in the speaker's foundry designed to service and maintain mechanized foundry equipment in the melting, core, hard iron, annealing, cleaning, processing and shipping departments. Mr. Luther illustrated his talk with slides showing plant maintenance operations, and said that a well-organized maintenance program should include regular scheduled inspection and repair, definite lubricating procedure, detailed records of performance and costs and encouragement of suggestions for improvement of existing equipment.

Designing for light alloy castings, especially magnesium, was the theme of the Tuesday morning aluminum and magnesium session. Presiding was C. E. Nelson, Dow Chemical Co., Midland, Mich.; co-chairman was W. T. Bean, Jr., consultant, Detroit. First paper

ANNUAL BANQUET, 53rd CONVENTION OF THE AMERICAN FOUNDRYMEN'S



was "*Designing Magnesium Castings for Aircraft Engines,*" by M. H. Young and A. G. Slachta, Wright Aeronautical Co., Wood Ridge, N. J. Pointing out that the advent of the gas turbine aircraft engine does not preclude use of magnesium alloy castings, the authors outlined the design for a 250 lb nose section.

Especially important, the paper stated, is elimination of stress raisers, the designer and foundryman both sharing in the responsibility. Following successful casting of the initial design this is proof tested with stress paint, electric strain gages, experimental engine operation and a 150 hr model test.

In his paper, "*Design of Light Metal Castings,*" G. H. Found, Dow Chemical Co., stated that the Design and Stress Analysis Committee of the A.F.S. Aluminum and Magnesium Division has the responsibility of promoting activities devoted to providing information about the relationship between design, choice of materials, their laboratory properties and serviceability.

Cut-and-try methods of casting design are becoming obsolete, said Dr. Found, and he explained the start of a design based on known safe static, fatigue, impact and creep strength properties of a given alloy. In addition to giving a summary of available design data, he emphasized the joint responsibility of designers and foundrymen in attaining efficient casting design.

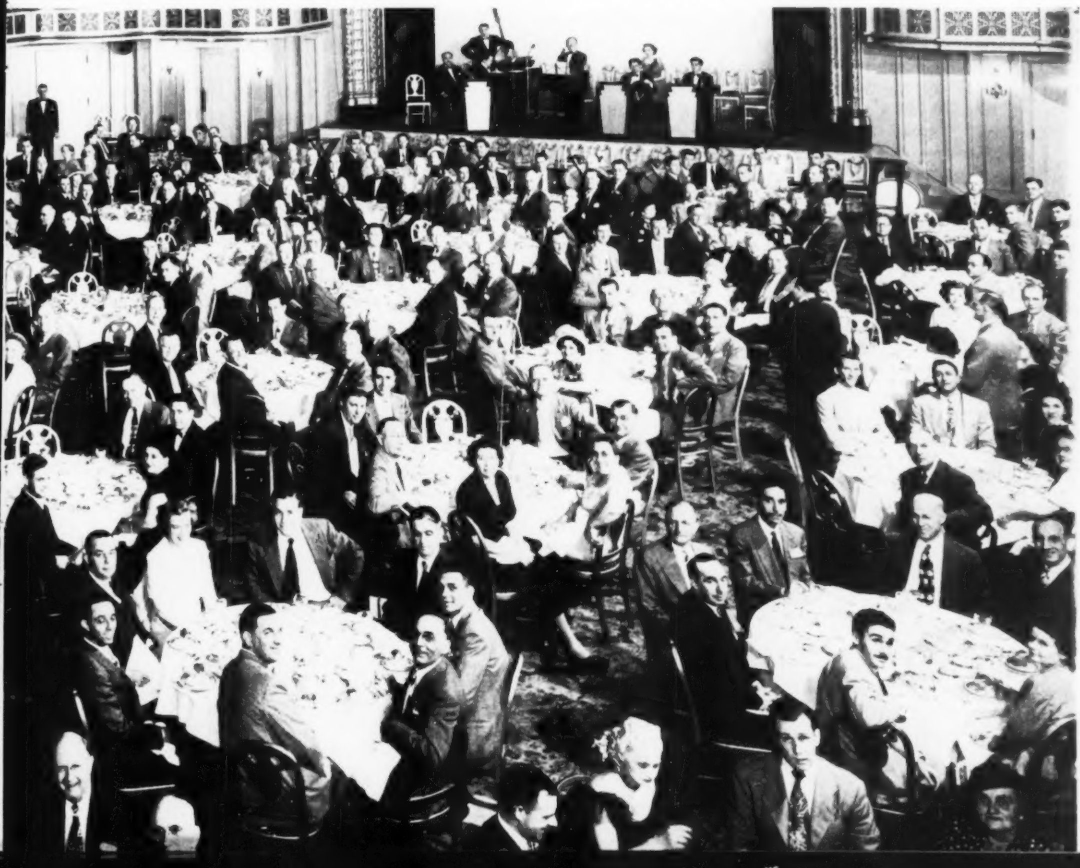
Fourth session sponsored by the Brass and Bronze Division, held the morning of May 3, started with a paper, "*Effect of Composition on Properties and Structure of Cast Monel,*" by J. T. Eash and T. E. Kihlgren, International Nickel Co., Bayonne, N. J., A. K. Higgins, Allis-Chalmers Mfg. Co., Milwaukee, was chairman and co-chairman was H. F. Taylor, Massachusetts Institute of Technology, Cambridge.

In presenting the paper, Mr. Eash explained the effect of variations in the base composition, melting practice and certain impurities on the mechanical properties and microstructure of cast monel, and the solution and precipitation hardening effects of silicon.

"*Recent Developments in Theory and Practice of Insulating Sleeves, Pads and Risers for Non-Ferrous Casting,*" by K. A. Mierické, U. S. Gypsum Co., Chicago, reported the properties and uses of a new metal casting plaster. Used to make riser sleeves and pads for insulating feeders and thin sections of castings to achieve controlled directional solidification, the material may be baked in regular core ovens, gives 50 per cent higher strength than previous similar materials and gives less trouble due to moisture absorption, Mr. Mierické said.

The chronological summary of events at the 53rd Annual A.F.S. Convention will be concluded in the June AMERICAN FOUNDRYMAN.

SOCIETY, THE GOLD ROOM, HOTEL JEFFERSON, ST. LOUIS, MAY 5, 1949



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National Malleable & Steel
Castings Co.
Cleveland, Ohio

SOCIETY ELECTS NEW OFFICERS AND DIRECTORS AT CONVENTION

National Officers and Directors of the American Foundrymen's Society for 1949-50 were elected at the Society's Annual Business Meeting, held during the 53rd Annual A.F.S. Convention in St. Louis.

Elected President of the American Foundrymen's Society for the coming year is A.F.S. National Vice-President **Edward W. Horlebein,** president of Gibson & Kirk Co., Baltimore. Mr. Horlebein will take over the duties of 1948-49 A.F.S. National President W. B. Wallis, president, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, at the Annual Meeting of the Society's Board of Directors this coming July.

Succeeding Mr. Horlebein to the A.F.S. National Vice-Presidency is **Walton L. Woody,** vice-president, National Malleable & Steel Castings Co., Cleveland.

Elected for three year terms as National Directors of the American Foundrymen's Society are:

T. E. Eagan, chief metallurgist, Cooper-Bessemer Corp., Grove City, Pa.

L. C. Farquhar, Sr., works manager, American Steel Foundries, East St. Louis, Ill.

V. J. Sedlon, president, Master Pattern Co., Cleveland.

F. G. Sefing, research metallurgist, International Nickel Co., New York.

L. D. Wright, superintendent, U. S. Radiator Co., Geneva, N. Y.

W. B. Wallis, president, Pittsburgh Lectromelt Furnace Corp., retiring A.F.S. National President, will serve as a member of the Society's Board of Directors for one year upon completion of his term.

Edwin W. Horlebein

President-Elect Edwin W. Horlebein has long been active in affairs of the American Foundrymen's Society, serving as a member of the A.F.S. National Board of Directors from 1945 until his election as National Vice-President in 1948, and as a member of the Executive Committee of the A.F.S. Brass and Bronze Division. Mr. Horlebein was instrumental in the formation of the A.F.S. Chesapeake Chapter and was elected its first chapter chairman in 1940.

A native of Baltimore, Mr. Horlebein began his career at the age of 18 as an apprentice machinist in the shops of the Baltimore & Ohio Railroad. Three years later, he was commissioned a lieutenant of Field Artillery during World War I.

Following the war, Mr. Horlebein joined the Dixie Manufacturing Co. of Baltimore as an engineer. He has been president of Gibson & Kirk Co., since 1924.

Mr. Horlebein holds memberships in the American Society for Metals, the American Society of Mechanical Engineers, the American Society for Testing Materials, the American Institute of Mechanical Engineers, the National Foundry Association and the British Institute of Metals.

F. G. Sefing

T. E. Eagan

Walton L. Woody

A.F.S. National Vice-President Elect Walton L. Woody is a Past National Director of the American Foundrymen's Society (1943-1945), and has for many years been active in the A.F.S. Malleable Division. Holder of a bachelor of science degree in Chemical Engineering from Rose Polytechnic Institute, Mr. Woody has spent his entire foundry career in the employ of the National Malleable & Steel Castings Co.

Upon graduation from college, Mr. Woody joined National Malleable & Steel Casting's Indianapolis plant as a student laboratory worker in 1914. A few months later, he was transferred to the Company's Toledo, Ohio, plant, for a short time in the same capacity. That same year, Mr. Woody was appointed a chemist in National Malleable's headquarters plant at Cleveland, where he later became, successively,

V. J. Sedlon

L. C. Farquhar

metallurgist and melter and assistant superintendent. Following this, Mr. Woody was consecutively manager of the Chicago, Cleveland and Sharon, Pa., plants of National Malleable & Steel Castings Co., prior to assuming his present position as vice-president.

Mr. Woody is a member of the National Foundry Association, the National Association of Manufacturers, the American Management Association, the Steel Founders' Society of America, and the Malleable Founders' Society.

Thomas E. Eagan

Director-Elect Thomas E. Eagan, chief metallurgist for The Cooper-Bessemer Corp., Grove City, Pa., is a past chairman of the A.F.S. Gray Iron Division (1945-1947). Holder of a bachelor of arts degree from Columbia University (1923), and bachelor of science degrees in Metallurgy (1925) and Metallurgical Engineering (1928) from the Missouri School of Mines and Metallurgy, Mr. Eagan is well-known to members of the Society as an authority on the metallurgy of babbitt and for his frequent contributions to the technical press on the subject.

Mr. Eagan has held positions as assistant metallurgist with Simonds Saw & Steel Co., Lockport, N. Y., and with Crucible Steel Co., Harrison, N. J., and was assistant superintendent of research for the Midvale Co., Philadelphia, prior to joining Cooper-Bessemer in 1934 as chief metallurgist.

He is a member of the American Society for Metals, the American Society for Testing Materials, the Society of Automotive Engineers, the American Institute of Mechanical Engineers, and the British Iron and Steel Institute.

Vincent J. Sedlon

Director-Elect Vincent J. Sedlon is president of Master Pattern Co., Cleveland, a position he has held since 1930. Mr. Sedlon has for many years been active in the A.F.S. Pattern Division, of which he is a past chairman and a member of the Executive Committee. Mr. Sedlon has been a frequent speaker on the subject of patternmaking before A.F.S. meetings and has contributed many articles to the technical press on the subject.

Born in Philadelphia, Mr. Sedlon completed his early schooling in that city. He has been associated with the patternmaking industry for more than 30 years—for the last 19 of them in his present position as president of Master Pattern Co.

L. D. Wright

Director-Elect L. D. Wright is manager of the Geneva, N. Y., plant of the United States Radiator Corp., and has for several years been instrumental in the A.F.S. Central New York Chapter. Mr. Wright served as temporary secretary of the Chapter during its formation, then as permanent secretary for two years, followed by two years as Chapter chairman. Mr. Wright has taken a leading part in the formation of the first New York State A.F.S. Regional Foundry Conference to be held this November and is its general program chairman. A graduate of the University of Michigan, Mr. Wright has spent his entire foundry career with the United States Radiator Corp., beginning as foundry foreman at the Dunkirk, N. Y., plant in 1922. A year later, he was appointed general foundry foreman at the Detroit plant, and in 1927 was transferred to the Geneva plant as foundry superintendent. He was appointed to his present position as Geneva plant manager in 1931. Mr. Wright served as a member of the 1948 A.F.S. Nominating Committee.

Lloyd C. Farquhar

Director-Elect Lloyd C. Farquhar is works manager of American Steel Foundries, East St. Louis, Ill. He has been active in the affairs of the A.F.S. St. Louis District Chapter for many years—having served two

L. D. Wright

W. B. Wallis

terms of three years each on the Chapter's Board of Directors. A native of Indiana, Mr. Farquhar received a B.S. in Metallurgical Engineering from Purdue University in 1910, joining American Steel Foundries that same year as an engineer. In 1914, Mr. Farquhar left American Steel Foundries to become special engineer and press shop superintendent for the Allegheny Steel Co., Pittsburgh. He served as a Captain in the Army Ordnance Department from 1917 to 1920, rejoining American Steel Foundries as assistant works manager after the war. In 1939, Mr. Farquhar was appointed to his present position as works manager of American Steel Foundries' East St. Louis, Ill., plant.

Frederick G. Sefing

Director-Elect Frederick G. Sefing, research metallurgist, International Nickel Co., New York, has for many years been instrumental in furthering the cause of better foundry education. As chairman of the A.F.S. Educational Division and of its predecessor, the Committee on Cooperation With Engineering Schools, he has influenced many young engineers, research men and technical workers to enter the foundry field.

In addition to his extensive efforts in the field of foundry education, Mr. Sefing is a member of the A.F.S. Gray Iron Division Advisory Group, a frequent speaker at Society meetings and has contributed many articles to the technical press on such varied subjects as core strengths, grain size, structure of cast iron and melting of brass and bronze.

Holder of a B.S. in Metallurgical Engineering from Lehigh University in 1919 and an M.S. in Metallurgical Engineering from Pennsylvania State College in 1924, Mr. Sefing's career has included work in both education and industry.

He has served, successively, as assistant metallurgist, Hudson Motor Car Co., Detroit; metallurgist, Rockford Drop Forge Co., Rockford, Ill.; chemical metallurgist, Pennsylvania State College; and metallurgist, Michigan State College, prior to joining International Nickel Co.

Mr. Sefing's efforts while at Michigan State College contributed largely to the formation of the annual Michigan Regional Conference of the American Foundrymen's Society. He is a past chairman of the A.F.S. Metropolitan Chapter.

W. B. Wallis

In accordance with the by-laws of the American Foundrymen's Society, 1948-49 A.F.S. National President W. B. Wallis will serve for one year as a National Director upon completion of his term as President. President Wallis has had a long and distinguished career of service to the foundry industry and to the American Foundrymen's Society, as a member of several A.F.S. national technical committees, as a National Director from 1943 to 1946, as A.F.S. National Vice-President in 1947-48, and 1948-49 President of A.F.S.

Born in Pittsburgh, Mr. Wallis attended Pennsylvania State College, where he was awarded a degree in Electrical Engineering in 1911. For four years, Mr. Wallis served in various engineering and sales capacities with power companies in Idaho and Pennsylvania. In 1915, Mr. Wallis became associated with W. E. Moore & Co., Pittsburgh consulting engineers, and later was named assistant general manager of the Jessop Steel Co., Washington, Pa.

In 1919, Mr. Wallis joined the Pittsburgh Lectromelt Furnace Corp., Pittsburgh, and a year later was appointed president of the Corporation.

Preparation Of Refractories Manual Planned At A.F.S. Committee Meeting

FULFILLING A LONG-FELT NEED of the foundry industry for an authoritative manual on foundry refractories, the A.F.S. Foundry Refractories Manual Committee met at A.F.S. Headquarters in Chicago March 4 to plan publication of the manual and to assign various sections and chapters in the book to writers who are authorities in the field. It is anticipated that the A.F.S. FOUNDRY REFRACTORIES MANUAL will be published in time for the 1950 Convention.

An outline of the contents of the proposed manual is as follows:

Chapter I—Fundamentals of Foundry Refractories.

Chapter II—Manufacture of Foundry Refractories.

Chapter III—Ceramic Materials and Terms.

Chapter IV—Tests for Foundry Refractories.

Chapter V—Applications of Refractories. The various sections of this chapter are devoted to the materials, preparation, installation and maintenance of foundry refractories in melting units. The final section is devoted to special foundry refractory applications.

Concluding the volume is an extensive bibliography and index.

Committee members present at the meeting were: Chairman A. S. Klopf, Western Foundry Co., Chicago; Secretary R. P. Schauss, Illinois Clay Products Co., Chicago; R. H. Stone, Vesuvius Crucible Co., Swissvale, Pittsburgh, Pa., who will edit the Foundry Refractories Manual manuscript, and Jos. E. Foster of A.F.S. Headquarters, Chicago.

National Castings Council Officers Elected In April For 1949-50 Term

NEW OFFICERS of the National Castings Council elected and announced at the Council's meeting April 14 at the Hotel Cleveland are: *president*, Collins L. Carter, Albion Malleable Iron Co., Albion, Mich.; and *vice-president*, W. L. Dean, Mathews Conveyor Co., Ellwood City, Pa. Re-elected were: *treasurer*, F. Ray Fleig, Smith Facing & Supply Co., and *secretary*, F. G. Steinebach, Penton Publishing Co., both of Cleveland.

National Castings Council was formally organized to provide a medium for cooperative action among its members on matters of mutual interest beyond the scope of the individual societies or in connection with problems which can be handled better by cooperative action.

Members of the Council are: American Foundrymen's Society, Foundry Equipment Manufacturers' Association, Foundry Facings Manufacturers' Association, National Foundry Association, Gray Iron Founders' Society, Malleable Founders' Society, Non-Ferrous Founders' Society and Steel Founders' Society.

HIGHLIGHTS OF 53RD CONVENTION ADDRESSES

". . . The second job I ever held was in a foundry and I was once an ardent, if unimportant member of the American Foundrymen's Society . . . The nature of my work would be considered unusual today—I was working on a war order for the Russian Government . . . Those of us who can go back these 33 years together have seen fundamental changes in the foundry art, and almost unbelievable changes in the type and character of castings now wanted by our customers . . . The use of ferrous metals is growing steadily in plane manufacture as range, speed and altitude become ever greater . . . We of the Air Force are directed to create and maintain equipment and personnel on the most efficient basis possible at a minimum cost to the taxpayer . . . I am sure there are people in this room earning $50,000—they pay annually for the support of the Army, Navy and Air Force alone some $6,800 and for aid to foreign countries, another aspect of security, some $3,200 . . . If one's income is $10,000 his stake is $620 for the 'Pentagon' and $290 for foreign aid and if $5,000, the figures are $238 and $112 . . . The history of the fall of past democracies has been destruction through taxation . . . Surely we all agree that the military posture considered essential by the President and Congress should be purchased for as little money as possible . . . We must have that posture, however, because you can't measure security in dollars and cents and there can be no 'price' on the blood of our sons . . ."

W. STUART SYMINGTON
Secretary of the Air Force
Washington, D. C.
ANNUAL BANQUET SPEAKER

JOHN HOWE HALL
Foundry Consultant
Swarthmore, Pa.
CHARLES EDGAR HOYT ANNUAL LECTURER

"At first, many who favored adoption of welded assemblies were inclined to urge exclusive use of rolled and forged parts. As a result, the structures produced often were composed of so many small pieces that much metal was wasted in cutting up the raw material, and labor costs for welding were unduly high. It was not long before it became evident that great economies in both material and labor could be secured by use of steel castings for the more intricate portion of the assemblies, reserving rolled or forged steel for the simpler shapes. . . TRANSACTIONS OF A.F.S. for the past 15 years contain many valuable papers on the subject of making major repair welds in steel castings and of producing welded assemblies of which castings form a larger or smaller part . . . When highly trained welders work in cooperation with metallurgical experts, welds are now produced that are as strong as the steel upon which they are made . . . The art of welding has been assisted by two major factors. The first and perhaps the most important of these was the invention of means of protecting the deposited metal from oxidation and contamination. The second factor was the use of radiography and magnetic powder inspection . . . examination of welds made to unite two separate parts insures satisfactory and homogeneous deposits of weld metal . . . When very heavy sections are to be joined it is often advantageous to use the thermit welding process . . . this process makes it possible to obtain pieces from foundries that could not be made as integral jobs."

"During the past year I have been fortunate enough to have visited every Chapter of the American Foundrymen's Society and every Regional Conference but one, and as a result of this close contact, certain impressions have been gained . . . Most outstanding is my impression that the men of our Chapters are intensely interested and unselfishly active in carrying on their jobs . . . The Society owes a debt of gratitude to these men . . . There are two splendid opportunities for our Chapters: first, to induce members to use and appreciate the inherent values of their membership, and second, to show those who are not members how they benefit from the contacts, the vast experience and the pride of craft that designate members of this technical society . . . The only coordinated research activity being conducted by the castings industry today and made freely available to the industry as a whole is that sponsored by your Society . . . Our fundamental problems cannot be solved by scattered effort—but by coordination of all the principles the foundry industry can muster . . . During the past year we have endeavored to take the Chapters into our complete confidence by showing where the membership dollar goes, why Society activities cost more today . . . We have no doubt that some of the members will disagree with some of our actions—and certainly we could not expect or want it otherwise . . . Yet your directors have steadfastly held to the principle that your Society cannot remain stagnant but must move forward . . ."

W. B. WALLIS
President, American Foundrymen's Society
PRESIDENT'S ANNUAL ADDRESS

ANNOUNCE WINNERS in 26th Annual APPRENTICE CONTEST

Raymond S. Lipowski
1st, Steel Molding

William C. Oliver, Jr.
1st, Gray Iron Molding

John W. Burkholder, Jr.
1st, Patternmaking

Elmer J. Turk
1st, Non-Ferrous Molding

Twelve top ranking foundry apprentices won the acclaim of the foundry world when they were adjudged winners in the 26th Annual A.F.S. Apprentice Contest April 2 at the 1949 National Apprentice Contest Judging in St. Louis. Entries in the finals numbered 71.

First prize winners in their respective contest divisions are: *Gray Iron Molding,* William C. Oliver, Jr., Caterpillar Tractor Co., Peoria, Ill.; *Steel Molding,* Raymond S. Lipowski, Bucyrus-Erie Co., Milwaukee; *Non-Ferrous Molding,* Elmer J. Turk, Wellman Bronze & Aluminum Foundry, Cleveland; and *Patternmaking,* John W. Burkholder, Jr., Central Pattern Co., St. Louis. The four top divisional contest winners were guests of the American Foundrymen's Society at the Society's 53rd Annual Convention in St. Louis, May 2-5, where they received $100 prizes and certificates from A.F.S. National President W. B. Wallis at the Annual Business Meeting, held Wednesday, May 4.

Second prize winners, who received $50 prizes at appropriate plant or A.F.S. Chapter ceremonies are: *Gray Iron Molding,* Chester J. Konopinski, Fulton Foundry & Machine Co., Cleveland; *Steel Molding,* Elmer E. Hollibaugh, General Metals Corp., Oakland, Calif.; *Non-Ferrous Molding,* Donald Inman, Western Aluminum Match Plate Corp., Cleveland; and *Patternmaking,* Donald A. Siebert of the Royal Pattern Works, Cleveland, Ohio.

Winners of the $25 third place prizes are: *Gray Iron Molding,* Thomas H. Conrad, Fulton Foundry & Machine Co., Cleveland; *Steel Molding,* Robert Conner, Continental Foundry & Machine Co., East Chicago, Ind.; *Non-Ferrous Molding,* Edmund J. Skowronski, Ampco Metal Co., Milwaukee; and *Patternmaking,* Harlan A. Killian of the Birdsboro Foundry & Machine Co., Birdsboro, Pa.

Castings and patterns entered in the 1949 A.F.S. Apprentice Contest, representing the best selected from Chapter and plant contests throughout the United States and Canada, were exhibited at the 53rd A.F.S. Convention in St. Louis. The 12 prize-winning entries

(Left) Judging Steel and Non-Ferrous Molding entries in the 1949 A.F.S. National Apprentice Contest are, left to right: Steve Ban, American Brake Shoe Co.; C. B. Shanley, Semi-Steel Casting Co.; T. E. Padkins, American Brake Shoe Co., all of St. Louis; Jos. E. Foster, A.F.S. Headquarters, Chicago; and F. W. Burgdorfer of the Missouri Pattern Works, St. Louis.

At the A.F.S. National Apprentice Contest Judging Luncheon were, counterclockwise, starting left, M. R. Bass and Thomas Ross, David Ranken Trade School, St. Louis; F. W. Burgdorfer, Missouri Pattern Works; Jos. E. Foster, A.F.S. Headquarters; Roy Schroeder, University of Illinois; Steve Ban, American Brake Shoe Co.; C. B. Shanley, Semi-Steel Casting Co.; T. E. Padkins, American Brake Shoe Co.; Harry Fraser, Scullin Steel Co.; A. L. Hunt, American Brake Shoe Co.; E. J. Aubuchon, M. A. Bell Co.; and Roy A. Jacobsen of Carondelet Foundry Co., St. Louis.

will be a featured part of the A.F.S.-sponsored foundry exhibit at the Museum of Science and Industry, Chicago, where they will replace the 1948 winning entries as exhibits for one year.

An innovation in this year's Contest was the use of one pattern design and size for all three molding divisions, a practice which permits comparison of gating and risering practices considered best for the various types of alloys. In past years each molding division used pattern design selected especially for that division. Again this year, as they were in 1947, all castings were radiographed. Last year only the prize winning castings were examined to confirm internal soundness.

One of the largest in A.F.S. history, the 1949 Apprentice Contest had 50 companies and seven A.F.S. Chapters represented in the National Judging, with 20 entries in Gray Iron Molding, 9 in Steel Molding, 15 in Non-Ferrous Molding and 27 in Patternmaking. These 71 entries reached the National Judging only after being selected from hundreds of entries submitted in plant and Chapter contests.

National Judging of castings entries took place at the Scullin Steel Co., St. Louis, and Patternmaking judging at the David Ranken, Jr., Trade School, St. Louis, April 2.

All castings entries were radiographed by the Scullin Steel Co., St. Louis, and American Steel Foundries, Inc., Granite City, Ill., prior to the final judging. Templates for use in judging Patternmaking entries were made by the Missouri Pattern Works, St. Louis, whose president, F. W. Burgdorfer, as chairman of the St. Louis Chapter Apprentice Training Committee contributed a great deal of his time and efforts in making arrangements for the National Judging.

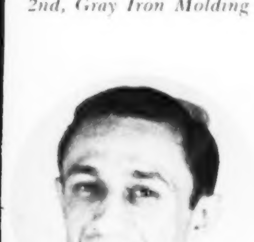
Six St. Louis area judges selected the winning castings and patterns. Casting judges were: C. B. Shanley, Semi-Steel Casting Co., St. Louis; T. E. Padkins, Scullin Steel Co., St. Louis; and Steve Ban, National Bearing Division, American Brake Shoe Co., St. Louis.

Chester J. Konopinski
2nd, Gray Iron Molding

Elmer E. Hollibaugh
2nd, Steel Molding

Donald Inman
2nd, Non-Ferrous Molding

Donald A. Siebert
2nd, Patternmaking



Thomas H. Conrad
3rd, Gray Iron Molding

Robert Conner
3rd, Steel Molding

Edmund J. Skowronski
3rd, Non-Ferrous Molding

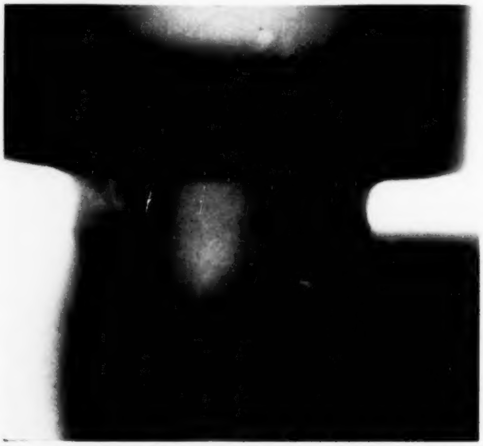
Harlan A. Killian
3rd, Patternmaking

Paternmaking judges were: Fred W. Wack, Central Pattern Co., St. Louis; Roy A. Jacobsen, Carondelet Foundry Co., St. Louis; and Harry Fraser, Scullin Steel Co., St. Louis.

Roy W. Schroeder, instructor in Foundry Practice and Patternmaking, Navy Pier Branch, University of Illinois, Chicago, chairman of the A.F.S. Apprentice Contest Committee, and Jos. E. Foster, A.F.S. Headquarters, Chicago, were responsible for coordinating the contest judging, and disclosed the names of the winners, who were identified only by number until completion of judging.

As in last year's contest, the majority of the winners were in the Services during World War II and have been associated with the foundry industry only since leaving the Armed Forces.

William C. Oliver, Jr., first place winner in the Gray Iron Molding Division, left high school in Camden, Ill., to enter the Marines in 1940. He served as



All castings entries in the 1949 A.F.S. Apprentice Contest were radiographed for internal soundness. The entry pictured, one of few showing shrinkage, scored two points of a possible 15 for soundness.

a machine gunner in the South Pacific and was awarded a Presidential Unit Citation. He is this year completing a four-year apprenticeship with Caterpillar Tractor Co., Peoria, Ill.

Chester J. Konopinski, winner of second place in Gray Iron Molding, is a native of Cleveland, where he worked as a laborer in the Cuyahoga Foundry, as a mechanic for Bishop Products Co., and as a laborer for Fulton Foundry & Machine Co., before the war. During World War II, he saw action with the Navy in the Asiatic-Pacific and European Theaters and received four battle stars. Following a year's training in molding practices at the Cleveland Trade School in 1946, he rejoined the Fulton Foundry & Machine Co., Cleveland, where his on-the-job training as an apprentice molder will terminate early in 1950.

Another apprentice of the Fulton Foundry & Machine Co. is Thomas H. Conrad, winner of 3rd place in Gray Iron Molding. A native of Pennsylvania, he joined the Marine Corps shortly after graduation from a Cleveland high school, attaining the rank of Corporal. Discharged in 1946, he joined Fulton Foundry & Machine Co. as an apprentice patternmaker, and is this year attending the John Huntington Night School, Cleveland, class in blueprint reading.

Steel Winner First For West Coast

Winner of first prize in the Steel Molding Division, Raymond S. Lipowski, is in his fourth year as an apprentice molder with the Bucyrus-Erie Corp., Milwaukee. Prior to joining Bucyrus-Erie, he attended the South Milwaukee Vocational School and was employed by Cudahy Bros., Cudahy, Wis., as a laborer, and by the Kyle Corp., Milwaukee, first as a clerk and then as a laborer.

The Steel Molding Division's second prize winner, Elmer E. Hollibaugh, is a native of California, and attended Lanley Technical Institute in Oakland, where he studied molding and coremaking prior to serving as a Staff Sergeant in the Field Artillery from 1939 to 1945. He completed his apprenticeship with General Metals Corp., Oakland, May 12.

Robert Conner, 3rd place winner in Steel Molding, is completing his last year of apprenticeship with the Continental Foundry & Machine Co., East Chicago, Ind. A graduate of Noll Central High School, Hammond, Ind., in 1941, he joined the Army the following year, while an apprentice at Continental. Upon discharge, he resumed his apprenticeship there.

Non-Ferrous Molding Winners

First prize winner in the Non-Ferrous Molding Division, Elmer J. Turk was employed by the Wellman Bronze & Aluminum Co., Cleveland, before the war. Leaving there in 1943 he joined the Army, attaining the grade of Master Sergeant in an artillery unit. He has completed three years of his apprenticeship.

Apprentice Molder Donald Inman, winner of second place in Non-Ferrous Molding, is 19 years old and a native of Cleveland. He is attending courses in molding at the Cleveland Trade School and has been an apprentice at the Aluminum Match Plate Co., Inc., Cleveland, since this February.

Third place winner in Non-Ferrous Molding Edmund J. Skowronski is a native of Milwaukee, where he attended the Milwaukee Vocational School. Employed as a sand mixer and bronze molder at the Milwaukee Malleable & Gray Iron Co., Milwaukee, and by Ampco Metal, Inc., Milwaukee, in 1941, he left there to serve as a Sergeant in the Quartermaster Corps in the Pacific Theater during World War II. Upon discharge in 1946, he returned to Ampco Metal, Inc., as an apprentice molder.

Pattern Winner Also In 1948 Contest

John W. Burkholder, Jr., 1st Prize, Patternmaking, is on the second of five years' apprenticeship with the Central Pattern Co., St. Louis, where he placed third in the local patternmaking contest held by the St. Louis District Chapter last year. He left high school in Normandy, Mo., in 1944 to join the Navy, and joined Central Pattern Co. as an apprentice in 1947. He is attending Hadley Vocational School, St. Louis.

Donald A. Siebert, winner of second prize in Patternmaking, started work as a patternmaking apprentice in 1946 with the Royal Pattern Works Co., Cleveland, just after graduation from high school but left after one month's training and entered the Coast Guard for two years. In March, 1948, he resumed his interrupted training with the Royal Pattern Works Co. While at Cleveland's West Technical High School, he won the school's Patternmakers' Cup.

Third place winner in Patternmaking, Harlan A. Killian, is a native of Pennsylvania, where he attended school and later worked as a laborer with a construction company. After serving in the Army for a year, he joined the Birdsboro Steel Foundry & Machine Co. as an apprentice patternmaker in 1948.

Firms Contribute Assistance

Credit in a large measure for the success of the 26th Annual A.F.S. Apprentice Contest should go to those organizations associated with the foundry industry who have contributed facilities, materials and financial assistance to the Contest. They are:

Scullin Steel Co., St. Louis; American Steel Foundries, Granite City and Chicago, Ill.; Waukesha Foundry Co., Waukesha, Wis.; Brown & Sharpe Mfg. Co., Providence, R. I.; Western Foundry Co., Chicago.

Link-Belt Co., Chicago; Beardsley & Piper Division of Pettibone Mulliken Corp., Chicago; Fulton Foundry & Machine Co., Inc., Cleveland; Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

Industrial Pattern Works, Chicago; Sheffield Foundry Co., Chicago; Plastic Corp. of Chicago; Caterpillar Tractor Co., Peoria, Ill.; International Harvester Co., Chicago, and the David Ranken, Jr., Trade School.

Annual IBF Conference June 14-17

Annual conference of the Institute of British Foundrymen will be held June 14-17 at Cheltenham Spa. The 46th annual meeting of the Institute, this year's conference is under the auspices of the Bristol and West of England Branch. On the four-day program are two days of technical sessions, a day of plant visitations, a day of council and committee meetings and a ladies program including receptions, dinners and visits to local points of interest.

Highlights of the conference are: receptions the evening of the first and second day; the annual general meeting on June 15, including presentation of awards, the presidential address and the Edward Williams Lecture; and the annual dinner and dance.

Technical session features include exchange papers from the French Foundry Technical Association and the American Foundrymen's Society. The A.F.S. paper, by Dr. Austen J. Smith, Michigan State College, is entitled *"Some Problems in Bronze Foundry Practice."* The French paper deals with apprentice training. Other papers and committee reports, including a paper on costs from the South African Branch, deal with heat treatment of alloy cast iron and malleable iron, aluminum alloy practice, use of ethyl silicate, coke and cupola charge materials.

Prepare 1948-49 Chapter Rosters

Rosters for the 1948-49 season have been prepared and distributed by the Northern California and the Northeastern Ohio Chapters.

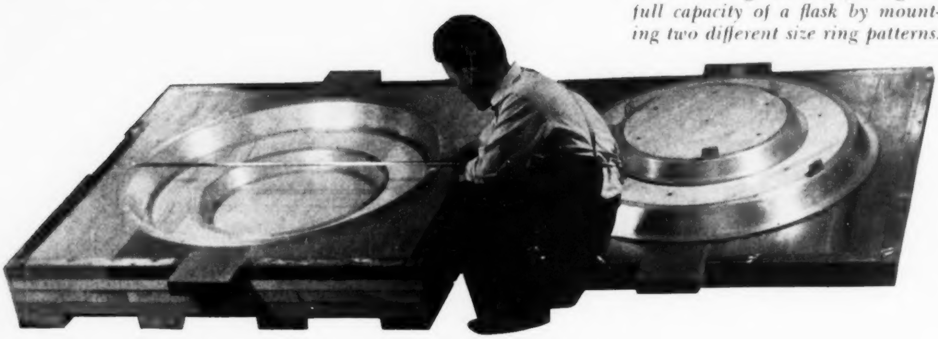
The Northern California Chapter roster and industry directory includes a brief outline of national A.F.S. activities and a history of the chapter. By-laws of the chapter are given and pattern shops holding membership, and company members and sustaining members are listed separately.

The Northeastern Ohio Chapter roster listings are by individual and by company with separate listings for company and sustaining members. Heading the role of past presidents of the chapter is Walton L. Woody, National Malleable & Steel Castings Co., Cleveland, elected National Vice-President of A.F.S. at the Annual Business Meeting in St. Louis during this year's Annual A.F.S. Convention.

Patternmakers' Group Of Northeastern Ohio Chapter Meets

The Patternmakers' Group of Cleveland, whose members belong to the A.F.S. Northeastern Ohio Chapter, held their own meeting in March in lieu of the regular Chapter meeting, which was cancelled because of the A.F.S. Ohio Regional Foundry Conference, Columbus, March 11-12. Ordinarily, the affiliate Patternmakers' Group holds meetings in conjunction with those of the Chapter.

Hardwood cope and drag equipment showing method of using the full capacity of a flask by mounting two different size ring patterns.



HIGH PRODUCTION PATTERNS

V. J. Sedlon
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PRESENT-DAY PATTERN EQUIPMENTS are fundamentally the same as those which have been used for many decades. If no thought is given to production, the traditional loose pattern may be used. Patterns mounted on a board may be used to increase casting production, and for highest efficiency modern production pattern equipment is available.

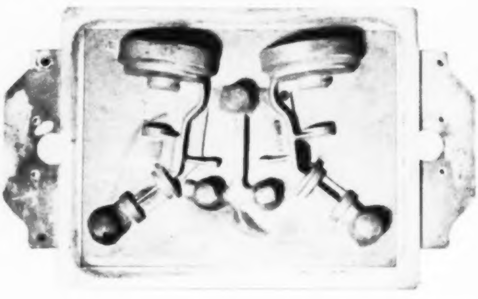
For small orders or one-casting jobs few or no changes have been made in pattern equipment design or the method of molding. It is in the larger casting orders that the time-saving and cost-reducing methods are important. Modern demands for better castings and higher production rates have created a necessity for patterns which will speed up molding, coremaking and coresetting operations, and produce castings to closer dimensional tolerances and with improved appearance.

Numerous foundry difficulties such as dirt, slag, shrink, blows, swells, strains, shifts, misruns, drops, washes, and ram-offs will be encountered regardless of the type of pattern equipment used. These difficulties are seldom, if ever, caused by the pattern. They are foundry problems which are usually corrected without change in the pattern itself. The foundryman's knowledge, which enables him to overcome the aforementioned difficulties, is not generally shared by the pattern maker. However, the pattern maker does have a knowledge of the principles of molding and coring, and this enables him to make a practical equipment. All information necessary to the construction of the pattern and affecting the moldability is usually given to the pattern maker by the foundryman before the pattern job is undertaken.

If a casting job is sufficiently large to warrant the making of a high production equipment, such as a match plate or cope and drag, the pattern maker should be informed as to the size of flask and the position of the pattern on the plate; also, which part is to be the cope or drag and the location of the parting line and the gating area. He should then determine the method of coring and the core print size, as well as the core box design, and whether the core is to be blown, hand-rammed and pasted, or booked. Further necessary information includes the number of cores in a box, whether a drier will be required, the number of driers to be supplied, and also whether fixtures for coresetting and pasting will be needed. These are basic instructions and necessary to the pattern maker who is interested in turning out a satisfactory job.

After the primary information has been received

Plastic match plate showing aluminum frame around plastic patterns. This equipment was made from a broken gate pattern. Duplication is one of the chief advantages of plastic patterns because there is no appreciable dimensional change due to contraction.



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from the foundryman, the equipment will require further planning by the pattern maker. For instance, consideration is given for the amount which is to be allowed for the contraction of the metal. An abnormal contraction such as occurs in malleable iron or steel also causes casting shrinkage difficulties. The craftsman will strive to overcome some of the undesirable effects of shrinkage by increasing the radii of fillets around bosses, pads, ribs, and walls. Also, in anticipation of a distortion because of the character of the casting, some parts of the pattern may not be made to blueprint specifications but are made in a way which will provide a dimensionally correct casting.

The practical pattern maker will determine whether to add or subtract draft to a given dimension in order to fit a mating part, and how to support cores in order to eliminate scars on the casting. Core print taper sufficient to permit ease in coresetting will be allowed. He will provide cope core print clearance to clear the core when closing the mold, and crushing strips around core prints to prevent breaking the edges of sand at the openings of castings. He will also provide for a sand clearance strip around the core print that will form grooves in which the loose sand may rest if accidentally scraped off the mold in setting the core. Also provided is the core print witness, or key, to prevent core shift or core tipping.

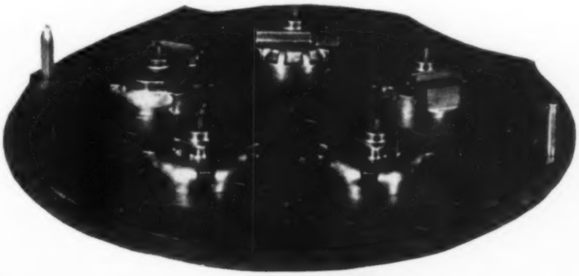
Core prints will be made to fit the cores snugly, especially on the ends. This will prevent core breaking under the stress of the molten iron. The pattern maker will see that perpendicularly placed pin cores will be tapered at both ends to facilitate production, and that they are made to fit snugly so that they will stand straight and firm. If the pin cores are too long to stand, a larger diameter print on the drag end will help. The setting of round cores which are placed horizontally may be more easily accomplished if the core prints are made slightly oval, thereby allowing a small amount of clearance at the parting. This clearance will prevent the loosening of sand, which is often caused by the rapid and not too careful setting of snugly fitted cores in a mold.

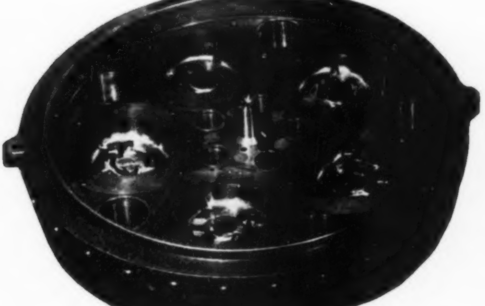
Pattern Maker Must Consider All Factors

Large cores may settle or sag, or they may hold the metal from its normal contraction. Allowances must be made for such irregularities. A pattern may have to be tilted on the plate to develop draft on a face which must be cast square; finish allowance must be added; and ram-off strips may be necessary to prevent sand creep. All of the contingencies of molding, coring, machining, and assembling are considered, and the pattern is designed to meet them. The pattern maker should also consider the possibility of changing the casting design to eliminate the necessity of loose pieces, extra cores, or any other difficult molding and casting problems. Sometimes a very small change will result in a large reduction in molding time and cost. Costly operations in machining, fitting, and assembling can also be reduced by accurately made patterns.

Aluminum is one of the most commonly used materials for small and medium sized production patterns. Its reasonably good wearing qualities and light weight make it desirable. The more permanent pat-

Five cast iron patterns are mounted on drag, squeeze, and blow plates. This equipment is used for stack molding.





terns are made of brass or iron, but because of the weight of these materials, they cannot be used for match plate molding and are generally used in conjunction with molding machines. The iron or brass patterns are machined all over whenever close tolerances are required. This has been necessary because of the inability to procure accurate and satisfactory pattern castings.

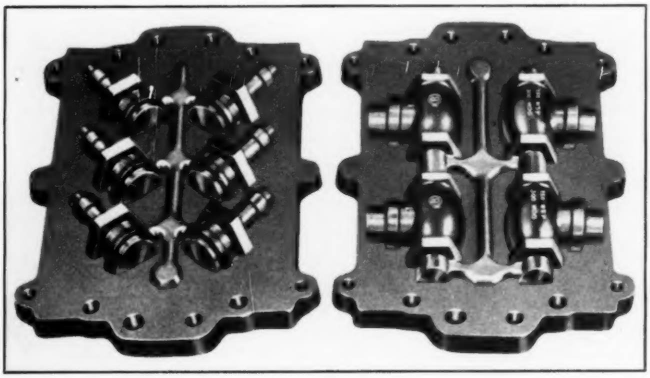
However, this handicap has been overcome. By a patented process an eastern foundry is now able to provide quite accurate and fine detail in iron castings. The contours and shapes of small castings are held within plus or minus 0.015 in. The surface has no scale and can be worked with a file or scraper in the same manner as aluminum. This is certainly a practical means of supplying a durable iron pattern or core box economically. An accurately made master pattern should be provided because every defect will be reproduced. An allowance of 1/32 to 1/16 in. should be made for machining the pattern or core-box partings.

Not too well known is a method of making multiple pattern equipments for cope and drag by using electroformed copper material. The manufacturers of these plates claim that they will wear as well as the common metals used for patterns. To obtain an electroformed copper pattern casting, a wood or metal master is supplied. A plaster cast is taken from the master and used to form by deposition a copper shell which is about 1/16 in. thick. This copper shell is backed up with a base metal alloy to support and strengthen it and prevent collapse.

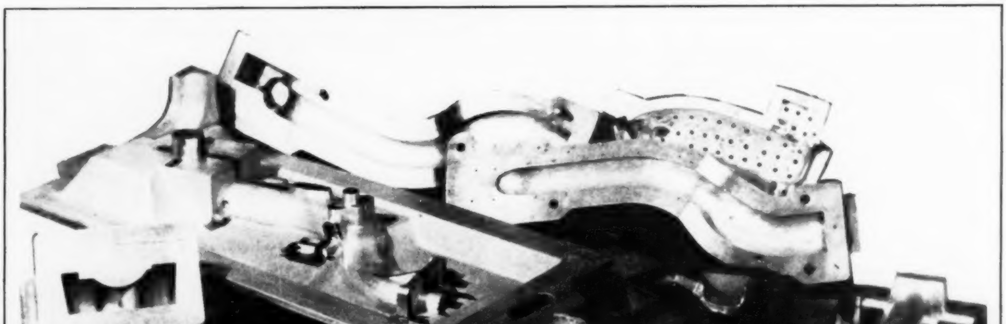
Brass inserts are cast-in for anchoring or fastening the patterns to the plate. No allowance for the contraction of the copper pattern is required. A fine detail is obtained and dimensional reproduction is almost perfect. Cost is higher than for sand-cast patterns, but the pattern cleaning time is eliminated, the patterns are smooth and ready to be mounted on plates, and are machined on joint faces to within 0.002 in. of a given dimension. The lead backing of these patterns causes them to be quite heavy; therefore, only small patterns should be used on a match plate. On equipments which are fastened to molding machines and in other cases where weight is not a factor, the electro-formed copper pattern is ideal.

Considerable interest and discussion has been shown in phenolic resins or plastics as pattern materials. The manufacturers of plastic patterns are convinced of the

Two plates with electrc-formed copper patterns mounted. One half of the pattern is mounted on one side of the longitudinal center line, and the mating half symmetrically opposite. This method allows both cope and drag molds to be made from the same side of one plate.



Manifold pattern mounted on match plate, steel-faced coreboxes, and pattern for drier equipment.



merits of this material. Like anything new, it may be some time before the merits of this material will create a demand for its use. From the point of view of the pattern industry its greatest advantage is in the replacement and duplication of a match plate or any finished pattern. Contraction in the material is slight, about 1/32 in. per ft, and no clean-up time is required. The patterns are smooth as glass and a partine application is not necessary for ease of drawing. The plastic pattern will not shrink nor swell, and is about the weight of aluminum. Plastics and their use as pattern material are being seriously appraised by the A.F.S. Pattern Division.

It is the pattern maker's responsibility to keep himself informed on all new pattern methods and materials, and convey to the foundrymen any ideas which may improve the foundry technique in producing castings. Accurate and complicated patterns require a higher skill and a greater knowledge on the part of the craftsman. The shop must also be properly equipped to develop the highest efficiency in the production of quality patterns. Stone-age methods are the exception rather than the rule in the pattern shops of today, and most shop owners realize the value of up-to-date equipment which will enable the pattern maker to do a better and faster job. Special devices such as contour shaping or follower attachments on the milling machines and lathes are indispensable.

Patterns Should Be Complete

To insure molding efficiency, each and every pattern should be engineered with its operational sequence carefully planned. Provisions should be made to prevent mechanical difficulties by furnishing fixtures and gages for coresetting, filing, and pasting. Core boxes should be provided with blow holes and vents; in addition, all wearing faces and loose piece seats should be steel faced.

Drier requirements and all accessories necessary to the production of castings should never be overlooked, casually dismissed, or evaded. A pattern equipment

Manifold high production aluminum cope and drag equipment. Pattern plates are steel-stripped at flask rest. Coreboxes are steel-stripped on strike-off faces.

for use where the foundry methods are of primary importance must of necessity cost more than one where this consideration is not a factor, but it should be remembered that the extra cost will soon be absorbed by the savings in molding, cleaning and assembling.

A high production pattern equipment is one that is designed to make use of every means to furnish better castings at the lowest cost. Certainly, there can be no better reason for supplying such an equipment.

Urge Early Selection Of National Nominating Committee Candidates

NAMES OF CANDIDATES for the 1949-50 Nominating Committee should be forwarded to the National President before July 1. According to Art. X, Sec. 1, of the By-Laws: *"The Board of Directors of each Chapter eligible to have a member on the Nominating Committee shall annually select two candidates for the Nominating Committee from the Chapter membership, preferably representing different branches or divisions of the industry within the membership. The names of the candidates shall be forwarded to the President on or before July 1 of each year."*

Eligible chapters, according to the By-Laws, are those not represented on the Nominating Committee during the past two years. The By-Laws provide that from the list of eligible candidates submitted by the various Chapters, the Executive Committee of the Board of Directors shall appoint six members to the Nominating Committee.

Chapter chairmen are urged to hold Board meetings as early as possible to select Nominating Committee candidates. Names should be forwarded to E. W. Horlebein, President, American Foundrymen's Society, 222 W. Adams St., Chicago 6, Ill. Appointment of the Nominating Committee is made by the Board of Directors' Executive Committee.

WET SYSTEM RECLAIMS FOUNDRY SAND

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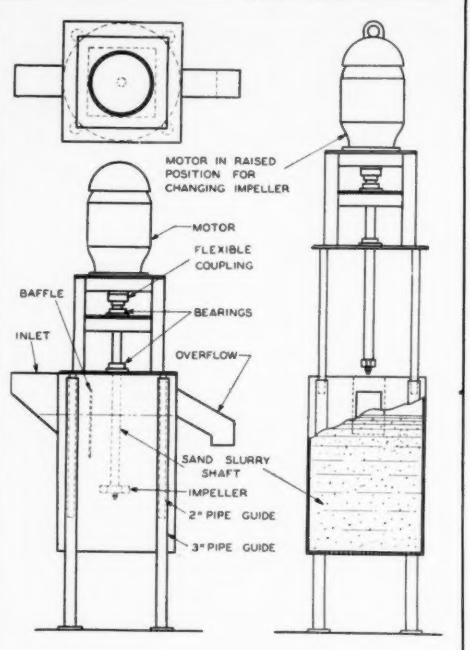


Sketch of wet reclamation system sand scrubber.

SAND RECLAMATION as referred to in this paper means the processing of waste foundry sand in such a manner that it will replace new sand in core and molding sand mixtures without increased cost in binders or other additive materials. Many factors in modern foundry practice demonstrate the need for a sand recovery system. Demands for closer sand grain distribution control, which results in better casting finish, reduction in casting defects, and lower cleaning costs, can be met by sand reclamation.

Other factors to be considered in a sand recovery program are increased freight rates, new sand handling costs, shortages of good base sands in many areas, sand disposal costs, and elimination of much of the new sand storage space. It is now a recognized fact that waste foundry sand can be salvaged, processed, and reused with many advantages in foundry operation and economies.

Foundrymen interested in sand recovery will immediately question the different methods by which this might be accomplished; namely, the dry, thermal, and wet methods. They consider the dry method of separation. This method is not satisfactory because it is only a separation of fine material and does not cleanse the material to be reused. They then compare the wet and thermal methods, and discover that there are 12 or 15 successful sand reclamation systems using the wet method. They also discover that in the ferrous field there are no successful systems using the thermal method alone. Some experimental work is being carried on at present with a combination of the two methods. In the writer's opinion, experience to date would indicate no advantage in the combination other than an improvement in color.

The wet or hydraulic method of reclaiming sand follows certain fundamentals in design and sand flow. If the wet method of casting cleaning is used, the initial process in wet sand reclamation is accomplished. If not, a wet lump breaker is used and all waste sand to be processed is introduced at this point.

A wet lump breaker consists of a revolving barrel into which a stream of water is directed. This water stream and the tumbling movement of the barrel wets and disintegrates the lumps and prepares the sand for treatment. The center portion of the lump breaker is perforated, and the sand discharges through the drum at this point. The gaggers, wood and other rejected material are discharged through the end of the lump breaker. The sand leaving the lump breaker passes through a screening operation and falls into a sand sump tank, and from there is pumped to the primary classifier. This may be overhead in the same general area as the lump breaker or at some distant point, depending upon the physical layout and production.

Selection of the proper type of classification equipment is important. For best results it should operate on the counterflow principle and be of sufficient size and capacity to allow sufficient settling time to assure fineness control and flexibility. In this type of classifi-

STEEL FOUNDRY SAND RECOVERY COSTS
(four-year-old wet sand recovery system)

BASIS: Plant operations—2 furnaces, 5 days per week. Sand reclaimer operating 2 full shifts of 8 hr each per day at average of 15 tons per hour, or 240 tons of sand per day.

Item	Cost Per Day	Cost Per Ton of Sand Washed
Labor (1 operator, 1 helper)	$55.41	$0.2308
Depreciation	38.28	0.1595
Insurance and Taxes	4.70	0.0195
Repairs	26.31	0.1096
Repair Overhead	9.21	0.0387
Fuel Gas	42.21	0.1758
Building	6.41	0.0267
Wasting Refuse	5.16	0.0215
Total Conversion	$187.69	$0.7821
Works General Expense (27%)	50.68	0.2111
Total	$238.37	$0.9932
Water	7.67	0.0319
Power	36.16	0.1506
Total Cost	$282.20	$1.1757*

*Cost per ton of washed reclaimed sand as of July 8, 1948 (new sand cost—$5.25 per ton in the bins).

cation, acceptable sand settles downward against a rising current of water, the velocity of which is easily and quickly controllable. The rising current of water is the means by which the reject material is removed. This operation controls the fineness number and grain distribution of the end product. As the counterflow water is increased, the fineness number is decreased. With this method of control, it is possible to reclaim a sand having a closer fineness control and grain distribution curve than the new sand supplier can guarantee.

In designing the primary classification unit consideration must be given to surges in sand feed from the wet lump breaker to the classifier. These surges will be caused by variations in the amount of material entering the wet lump breaker at different periods of the day. The primary classifier must be capable of handling these surges, and possible changes in sand character, structure, and size must be considered.

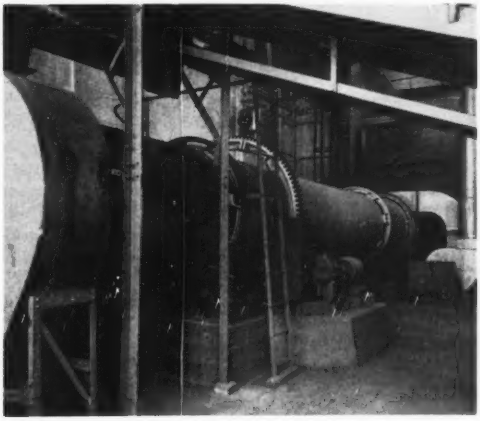
Both the primary and secondary classification must be readily adjustable so that the grain distribution of the sand product can be controlled. It is probable that most foundries using this method will desire to change the fineness and grain distribution of the reclaimed sand product periodically. This and all of the previously mentioned requirements can be accomplished with the counterflow method of classification if it is properly designed and engineered.

Secondary Classification Is Desirable

In some systems one classification is sufficient. In others, scrubbing of the sand grains is required after the first classification, in which case secondary classification is necessary to remove that material dislocated in the scrubbing operation. If the sand does not receive too much temperature abuse and the non-siliceous additions to the sand mixtures are not too high, one classification may be sufficient. However, it is felt that a complete unit including primary classification, scrubbing, and secondary classification is the best assurance that a reclaimed sand with the qualities of new sand will be obtained.

If the complete system is used, the sand moves from the primary classifier to a wet sand storage and dewatering tank. This storage tank should be of adequate size to allow several hours of operation in the event of a shortage of sand to the lump breaker. Also, from this point on a constant rate of flow of material is important, and adequate storage space assures this.

Upon leaving the storage tank the sand travels by gravity into the scrubbers. Much experimental work has been done on different methods of scrubbing foundry sands. It has been determined that the most effective method of scrubbing is the barrel type scrubber, which operates at high velocities. The scrubbing operation is accomplished at 60-65 per cent solids content. This allows much grain-to-grain contact, and the abrasive action separates the objectionable material from the sand grains. The scrubbing time is adjustable, depending upon the sand cleanliness. A standard size scrubber is used, and the number of scrubbers is increased as the tonnage demands are increased.



Rotary kiln dryer can be used for all types of sand.

From the scrubbing operation the sand flows into a sand sump tank and is pumped to the secondary classifier. In some cases, where ample head room is available, a gravity flow may be used from the scrubber directly to the secondary classification, thus eliminating the sand sump tank and this pumping operation. The secondary classification removes all objectionable material that has been separated from the sand grains in the scrubbing operation. All classification is of the counterflow water type, as previously described.

Select Dewatering Method

After secondary classification the sand may be dewatered by vacuum filtering, centrifuging, dragging on an incline, a screw conveyor, or leeching. Each of these dewatering methods has a definite place, and selection is dependent on the degree of dewatering desired.

The vacuum filter type will dewater to 5 to 10 per cent of moisture by weight, depending upon the fineness of the sand. The finer the sand, the more moisture retained, whichever dewatering method is used. The vacuum filter is one of the better methods; however, the capital investment is somewhat high.

Centrifuging gives comparable results. Maintenance cost is considerable, and capital investment is high.

COMPARISON OF NEW AND RECLAIMED CORE SANDS

Retained on Screen	Steel Sand, % New	Steel Sand, % Reclaimed	Gray Iron Sand, % New	Gray Iron Sand, % Reclaimed
6	....	....	....	....
12	....	....	....	....
20	1.2	0.2	0.1	....
30	3.8	1.2	0.6	0.7
40	14.0	8.4	9.2	7.5
50	35.6	31.8	49.9	43.0
70	31.0	38.2	22.2	29.1
100	8.6	11.0	6.4	9.5
140	5.0	8.4	6.8	6.7
200	0.4	0.6	4.2	2.8
270	0.2	0.2	0.4	0.5
Pan	....	....	0.2	0.2
PHYSICAL PROPERTIES				
Green Compression, psi	0.8	0.6	0.6	0.5
Green Permeability	173	173	119	119
Baked Permeability	440	440	138	140
Baked Tensile, psi	250	285	223.0	236.0
Gas Evolution @ 1850 F, cc/gram	....	....	1.4	2.0

This method requires less space than any of the dewatering methods.

The drag and screw conveyor type is low in capital investment and maintenance cost, but produces 15-20 per cent moisture sand, in which case fuel costs are increased in the drying operation.

Plain leeching is a perfectly good method of dewatering for the foundry that has available space for leeching bins. It is possible to dewater to 8-9 per cent moisture if the sand is allowed to leech for 24 hr or longer. This method is not practical in many large production foundries in that it requires an additional handling operation.

Sand can be dried by several methods. When the vacuum filter is used for dewatering, drying can be accomplished by the direct application of heat within the filter unit. This type of equipment has its limitations in that when fine or angular sands are to be processed, difficulties may be encountered by the blinding of vacuum filter screens.

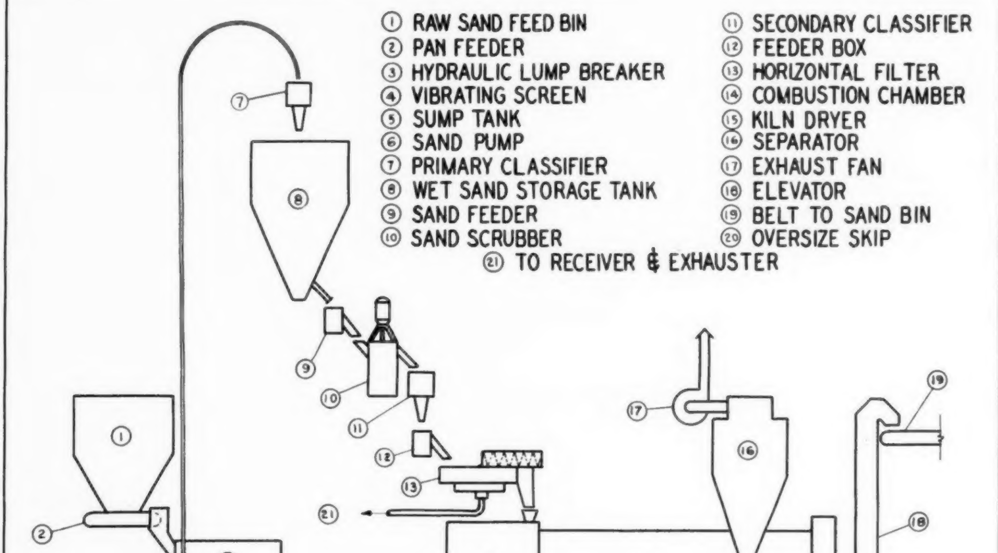
Satisfactory results may also be obtained with the rotary kiln type dryer. This type of dryer requires considerable floor space, but all types of sand can be dried by this method.

The equipment described is the type used in the wet method of sand recovery, and has been successfully operated in foundries processing from one to 60 tons of sand per hour. It is felt that sound engineering knowledge and experience is important in the designing of this type of equipment in order to assure a smooth flow and a quality end product.

Reclaiming costs of waste foundry sand vary considerably. Some users report the cost of recovery as equal to the former cost of sand disposal. This allows the complete delivered cost of new sand to be applied toward amortization of the equipment investment. Delivered cost of new sand varies from $4.00 in the Midwest to $11.00 or $12.00 on the west coast, where many foundries are now using sand from the Ottawa, Ill. region. It should be understood that foundries with sand recovery units have a continued need for only 10 to 15 per cent of the amount of former new sand purchases. This is caused by the loss in the reclamation process, dust collectors throughout the foundry, and other usual natural losses.

Many foundries report physical property results with sand reclaimed by the wet method as equal to or better than the results obtained with the equivalent new sand. Casting results, surface finish and workability of the processed sand, as reported by foundries using the method, are at least as good as with new sand practice.

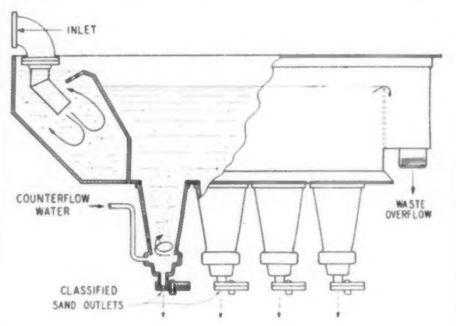
It might be well to review what might be reasonably expected of a wet sand recovery system. Tensile strength of reclaimed should be equal to that of new sand. Moisture content can be closely controlled. The sand will be usable in all foundry operations. The



Flow diagram for the wet sand reclamation system.

ADVANTAGES AND DISADVANTAGES OF THREE SAND RECLAMATION SYSTEMS

	Dry Reclaimer	Thermal Reclaimer	Wet Reclaimer
Advantages	1. Suitable for molding sand 2. Retains some clay bond 3. Low initial cost 4. Small space requirements	1. Suitable for recovery of clay-free core sands 2. Eliminates organic and carbonaceous materials 3. Produces reclaimed sand with a new sand color	1. Suitable for reuse as new sand in core and molding sand mixtures 2. Produces a product with constant grain distribution 3. Removes objectionable fines, organics, clays, and carbonaceous materials 4. Eliminates dust 5. Produces sand at nominal cost 6. Produces sand with physical properties equal to new sand
Disadvantages	1. Separation only—no cleaning of sand for reuse 2. High maintenance 3. Sand can be reused only as make-up in molding sand	1. High initial cost 2. Large space required 3. Interrupted operation costly 4. High operating cost 5. Requires dry dust collector equipment for fines and colloidal material removal 6. In some cases a spongy sand grain results, which requires additional binder when sand is reused	1. Requires all bond to be replaced if reused as molding sand 2. Higher in initial cost than dry reclaimer but somewhat lower than thermal 3. Does not produce a sand with new sand color



View of the hydraulic counterflow classifier unit in wet sand reclamation unit.

baking time of cores will be similar to that of new sand practice. The color of the processed sand will not have the eye appeal of new sand. The grayish cast is the result of a microfilm of carbonaceous material remaining in the cavities of the sand grains and which cannot be economically removed by scrubbing.

However, it is the opinion of many using this method that this residue material causes no trouble whatsoever. Sand grain size and distribution may be controlled to a much greater degree than even the new sand supplier is able to offer to the individual foundry. Objectionable fine material can be removed by the wet method. Some foundries now using the wet reclamation method find it advantageous to run new sand as well as waste sand through the reclaimer to accomplish this removal. Others are able to store new sand and reclaimed sand in the same storage space without fear of contamination.

Sand reclamation will effect a definite saving of storage space. Most foundries with recovery equipment are able to operate with 25 per cent of the former sand storage area. The need of storing a winter's supply of sand is eliminated. Some foundries have placed the reclamation equipment in the same space that had previously been used for new sand storage.

Summary

In many foundries sand can be reclaimed for the present cost of waste sand disposal. This will allow the entire cost of delivered new sand to be applied toward the cost of the reclamation equipment.

Many successful installations prove that the hydraulic method of sand recovery is economical and practical in all types of foundries where synthetic sand practice is used.

Installations processing as little as $1\frac{1}{2}$ tons of sand per hour are in successful use.

Physical properties and casting finish are equal to those obtained with new sand.

Engineering and designing of reclamation equipment is important to guarantee smooth flow and a quality end product.

A considerable saving in floor space is effected by the reduction of new sand storage bins.

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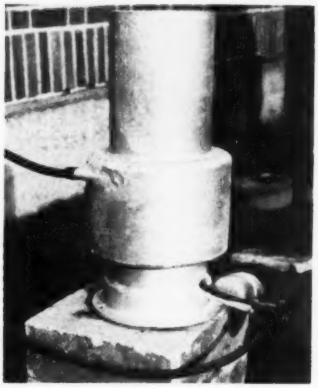
THREE-INCH CUPOLA AIDS STUDY OF CARBON ABSORPTION



(Above) Bed coke in McWane Cast Iron Pipe Co.'s three-inch experimental cupola is ignited by means of a standard bunsen burner placed at the tap hole.

BELIEVED TO BE THE WORLD'S SMALLEST CUPOLA now in operation, a three-inch cupola at McWane Cast Iron Pipe Co., Birmingham, melts iron and operates in a manner comparable to a much larger cupola.

First publicized last fall in an article in *Pig Iron Rough Notes*, quarterly technical publication of the Sloss-Sheffield Steel & Iron Co, Birmingham, the midget cupola has attracted world-wide attention.

Dr. Fred C. Barbour, chief chemist, and W. M. Spradlin, melting supervisor, McWane Cast Iron Pipe Co., designed and built the three-inch cupola to study the effects of the various elements in iron upon iron's ability to absorb carbon. Using an old bearing housing as a shell, Dr. Barbour and Mr. Spradlin constructed the "baby" on the scale of larger cupolas, with the result that its performance in every way approximates that of larger units.

Uses Proportionate Charges

Iron, flux and coke charges, made proportionately to those used in larger cupolas are made up as follows: one-half pound of iron, one ounce of coke, seven grams of limestone—an 8 to 1 coke ratio. The iron is broken into small pieces, however, solid pieces weighing as much as two pounds and steel charges have been melted successfully. The small size of the charges permits the operator to use a large number of charges of identical analysis if desired, since many of them can be obtained from a single piece of scrap.

The blast is supplied through a rubber tube connected to the wind box and operates on compressed air, with the blast pressure controlled by a U-tube manometer. Air passes from the wind box through six ⁵⁄₁₆ in. diameter round tuyeres into the cupola, three inches above the tap hole.

The operation is by intermittent tapping, at about two pounds of iron per tap, and the slag is drawn off through a back slag-hole located 1½ inches below the tuyeres. The cupola is placed on a 10 x 12 in. fire brick block, the sand bottom rammed in. The bed coke is ignited by placing a bunsen burner at the tap hole until the coke starts to burn, then the air is turned on. After the heat, the cupola is tilted to one side and rammed out clean.

Fred C. Barbour (holding ladle, right) and W. M. Spradlin, both of McWane Cast Iron Pipe Co., Birmingham, are shown tapping a heat from the experimental 3-in. cupola they built from an old bearing shell.

Dimensions Given

Dimensions of the "baby" cupola are:

Shell	5¾ in.
Height	18 in.
Inside Diameter	3 in.
6 Tuyeres (Diameter of each)	⁵⁄₁₆ in.
Slag Hole	1½ in. below tuyeres
Bed Height	3 in. above tuyeres
Tuyeres to Tap Hole	3 in.
Coke Size	½ in. down
Fluxing Stone	¼ in. down

The melting rate is approximately 0.03 T per hour, or 9.9 psi of cross sectional area per hour.

During the melting operation pictured on this page, the temperature was 2590 F, using comparatively large material (Talbot strips ½ x ½ x 1½ in.) With smaller material, temperatures up to 2640 F have been attained.

Proves Valuable Laboratory Aid

The cupola has proved to be a valuable laboratory instrument in determining the effect of various alloys on iron's ability to absorb carbon. In one series of tests, 50 charges of a base iron were used, with the phosphorus content being increased with each charge. The phosphorus was raised from 0.75 to 3.17 and the resulting carbon drop was from 3.56 to 2.45. Operation of the 3-inch cupola has proved so successful that several engineering schools have written its designers for blueprints, which they are glad to provide on request.

PRESELECTING FOUNDRY EMPLOYEES

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PROPER SELECTION OF PERSONNEL is as important as adequate training and education for foundry work.

The purchasing agent of a foundry who contemplates buying some new productive machinery investigates with real discrimination the several kinds available. He is interested in all the specifications, the initial cost, the possible upkeep, the rate of amortization, and the flexibility as well as the possibilities for modernization from time to time. If he plans to amortize the $2000 item in the course of a year he will budget $40.00 per week for this purpose. Buying equipment is an important activity, and each investment of this nature must be justified in terms of its eventual return to the organization.

Unfortunately, the addition of a new worker to the force is infrequently accompanied by such careful investigation. The purchasing agent previously mentioned is fulfilling his responsibility in terms of the ultimate value of his purchase. But, many men are employed only because they are available today. The mere fact of their availability may be a negative recommendation. Little thought is given to evaluating their promotability, productivity, flexibility, or their possible tenure. This condition does not exist only among foundries. The proportion of industry which has adopted a program of preselection tests for new employees is increasing, but it is by no means a universal practice.

Perhaps one of the drawbacks has been that hastily designed selection programs have not proved to be effective. The necessity for careful investigation with its attendant cost in productive hours and extra wages has served as a deterrent for those who do not yet understand the underlying basis for successful preselection programs.

Individual Traits Differ

All preselection programs are based upon the recognized differences which are found between individuals. No two workers are identical in all of their characteristics. Some excel in one trait, are mediocre in a second, and inferior in a third.

Others are mediocre in one trait, inferior in a second, and excel in a third. Others excel where the first are mediocre and are mediocre where the first are inferior. In measuring human abilities the psychologist attempts to find those qualities which are directly related to superior achievement. Once these have been discovered he screens out those who lack the desired quality and selects those with the greater potential for success.

Preselection would be simple if it could be accomplished on the basis of visible human characteristics. If an applicant has only one arm, if he walks with crutches, if one hand is paralyzed or mangled it is usually apparent to the employment interviewer. If both hands, or good legs and feet are required the crippled man is immediately screened as an applicant.

When it is necessary to employ those with high-level intelligence, unusual dexterity, superior visualizing ability, or unusual personality stability, the employment manager can make no accurate estimate without the use of some measuring device. It is for the measurement of such intrinsic qualities that the psychologist has designed a large number of devices.

Lest it be concluded that a preselection testing program can be instigated merely through the purchase of a few psychological tests it should be pointed out that no test can be expected to yield gratifying results until one is certain that it actually predicts achievement on the job. Any measuring technique to be valid must predict some established criterion. This criterion may be one of several; for example, the average hourly income of individuals on incentive wages, the number of pieces produced during a prescribed period, or the score received on a regular merit rating.

Two Superior Foundry molders being given the discriminative dexterity test at Western Reserve University (courtesy of Superior Foundry Iron Items).

The establishing of the validity (measuring accuracy) of a test is one of the first steps in a selection program. Many tests which appear to involve none of the behavior components necessary for job success have been found valid for predicting the criterion. Others which appear to involve all of the elements necessary for successful performance on the job have proved to lack the validity necessary for their inclusion in a testing battery. Consequently, nothing is taken for granted when the initial test program is set up.

NOTE: This paper was presented at the Ohio Regional Foundry Conference, sponsored by A.F.S. Ohio Chapters, at Ohio State University, Columbus, Mar. 11-12, 1949.

Tests must be tried or tested in the situation in which they are to be used. Oftentimes one of the already standardized tests prove valid. Then some new test must be designed to predict the criterion. Such tests need not be elaborate, nor are they confined to the type known as "paper and pencil" tests.

These paper and pencil tests are designed to measure and predict specific qualifications through the use of pictures, numbers, words and phrases to which one responds by simple checking or underlining, or by supplying missing information. They are called analytical measures since they purport to measure the qualities necessary for effective performance on a job. The tests may be graphic, manipulative, or even biographical. There seems to be no limitation on the types of tests save the ingenuity of the test maker.

When a test (or tests) has been found valid in

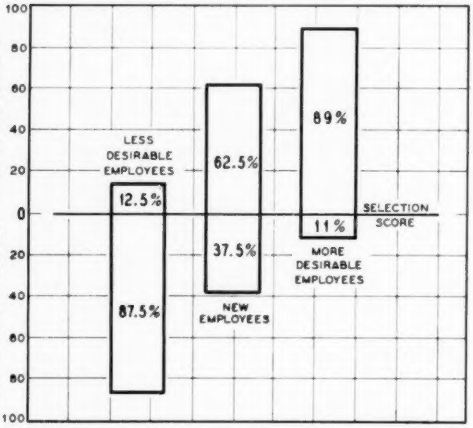
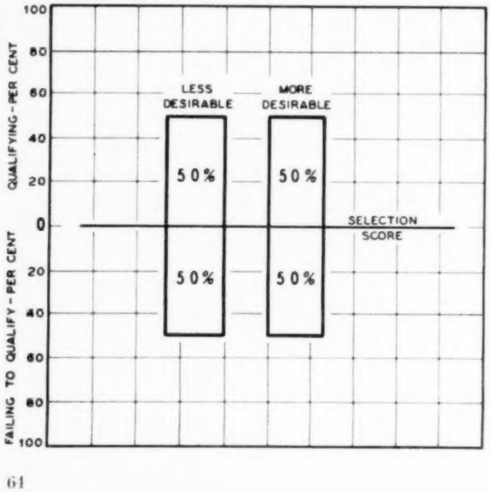


Fig. 1—Graph showing the percentage of each of three groups which qualified on the Biographical Inventory test in foundry "A".

Fig. 2—Percentage of each of two groups qualifying on a test which has no validity.



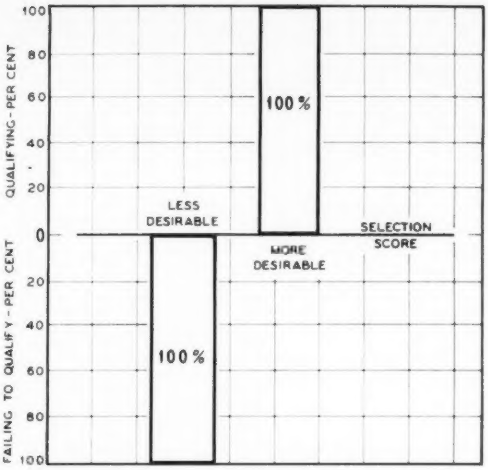


Fig. 3—Percentage of each of two groups qualifying on a test which has perfect validity.

predicting subsequent achievement, selection standards are established and the test can be used for screening of applicants for employment.

Several foundry organizations have experimented with selection tests of different kinds. Some have validated batteries of several tests which have been primarily verbal and dependent upon paper and pencil test results. Others have purchased standardized tests which they assumed would measure as well in the foundry as they do in the machine tool industry or in the assembly of small parts for which they were designed. This latter assumption has been particularly abortive and such programs have been nothing short of disastrous. To illustrate the use of tests in gray iron foundries some selection programs currently in use will be reviewed.

A frequent problem in maintaining a sufficiently large labor group is the rapid turnover of these men. In order to determine which qualifications predict long tenure and stability the biographical inventory has been used. This inventory consists of many items which are related to recent as well as more remote experiences. These items attempt to cover a large number of personal responses related to home environment, educational background, previous work experience, interests, social activities and recreation.

Selective Values Established

One may wonder how such items can be useful in predicting success. Suppose it were found that when all the better laborers were asked to what clubs they belonged, 90 per cent of them claimed "The Alpha," 10 per cent "The Beta," and none "The Gamma." If among the poorer laborers 80 per cent were members of "The Gamma," 20 per cent of "The Beta" and none "The Alpha," that item possesses selective value. Those who belong to Alpha are found among the better labor group, while those who belong to Gamma are in the poorer labor group. One would risk less and gain more by hiring an Alpha rather than a Gamma.

Perhaps Fig. 1 can be interpreted more readily by referring to Figs. 2 and 3. Figure 2 indicates the kind of results that would be obtained if the test had no predictive ability, or if its reliability were zero. This is a chance relationship and represents the type of results one should expect if the employees have been selected by the ordinary guess methods.

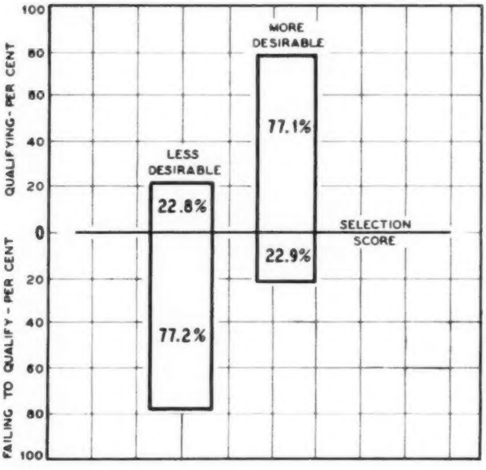
Figure 3 indicates the kind of results that would be obtained if the selection measures were infallible or had a validity which was perfect. Of course, we never achieve such validity but constantly strive for results as close to those in Fig. 3 as possible. The data presented in Fig. 1 become more meaningful when they are compared to the theoretical results in Fig. 3.

Although the results for the more desirable and less desirable groups of employees in foundry "A" overlap to a certain degree they indicate that in actual practice it is possible to approach the theoretical values shown in Fig. 3. The center bar of Fig. 1 represents scores made by a group of new employees and applicants who had not yet been rated as "more desirable" or "less desirable." If foundry "A" had employed only those applicants whose scores were above the selection standard the chances are 89 to 12 or 7 to 1 that they would eventually be rated as "more desirable" employees.

The biographical inventory was also used with the labor group in a second gray iron foundry. Two groups of men were selected as in the foundry "A" previously cited. When the inventories for the two groups in foundry "B" were scored it became apparent that the labor group for both foundries "A" and "B" were so nearly alike that they could be combined into two composite groups. The results for the more satisfactory groups of the two foundries were combined as were the results for the less desirable groups.

Of course, the biographical inventory was not used in the original selection of these men. Had it been available and applied 77 per cent of the present "less

Fig. 4—Graph indicating the percentage of each of two groups of laborers in two foundries qualifying on the biographical inventory which was scored on a combined key for both foundry "A" and foundry "B".



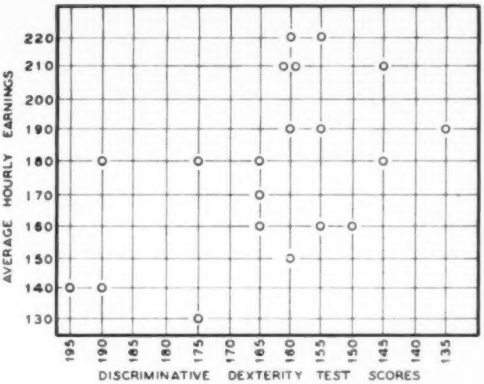
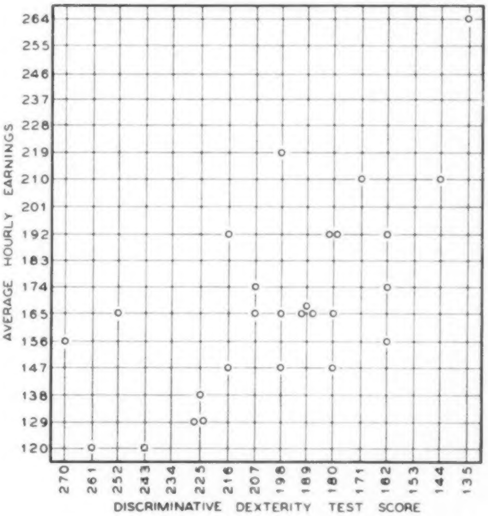


Fig. 5—Scatterplot of the average hourly earnings and scores on the Discriminative Dexterity Test by 20 machine molders in foundry "C". The Pearson Product Moment correlation is + 0.46. (Perfect prediction of wages from test scores is equal to 1.00. Chance prediction equals 0.00.)

Fig. 6—A scatterplot of the average hourly earnings and scores on the Discriminative Dexterity Test by 28 machine molders in foundry "B". The Pearson Product Moment correlation is + 0.696.



desirable" group would not have been employed. These results are shown in Fig. 4. With an increasing pool of labor resources the foundry that is able to select potentially good workers will profit greatly.

These data based upon biographical information gathered on a standardized blank demonstrate that the selection of foundry labor can be improved. Such an information blank can be used by the employment interviewer. It requires between 8 and 10 minutes to complete, and it can be scored in less than 2 minutes.

Selection of molders is one of the most important functions of the personnel office. Attempts have been made to perfect batteries of tests for molder selection. Some of these are heavily weighted with paper and pencil tests, and those involving verbal responses. These have proved to be successful in certain specific situations, particularly where the foundry is located in a small city where the educational level of workers is high. These tests have not been equally valid when used in foundries located in large urban areas with their heterogeneous populations.

Perhaps no test for molders will be universally valid, but attempts are being made to perfect measures which will minimize the verbal and educational factors. Such tests are likely to be performance tests involving dexterity and visual discrimination.

Performance tests do not rely on any verbal or educational factors. They may be taken successfully by those who have a language handicap or by the illiterate who is unable to respond to written questions. Performance tests require the performance of a manual task which might be based upon the ability to discriminate between varying visual cues.

Performance Test Is Comprehensive

Current research in foundry personnel selection by the Personnel Research Institute of Western Reserve University indicates that for foundries in urban centers verbal tests which involve an intelligence factor do not contribute anything to the selection of molders that can not be obtained by a performance test designed to measure dexterity and the ability to follow directions. A test called the discriminative dexterity test (DDT) has been administered to molders in representative gray iron foundries. This test measures not only speed of response but the ability to quickly and accurately adjust to new situations.

Twenty machine molders in foundry "C" were tested on the DDT. Figure 5 shows the relation between the scores on the test and the average hourly earnings for the preceding month. While the more favorable scores (a small number of seconds required to complete the test) are not related to high earnings in each case, there is a suggestion that earnings might be predicted from the test scores. This foundry is situated in a small Northern Ohio city and employs as molders men who are high school graduates.

In foundry "B" 28 machine molders were tested on the same test. The data in Fig. 6 represent the scores made by these molders and their average hourly earnings for the preceding month. In Fig. 6 there is a closer agreement between high earnings and favorable scores on the DDT than is evident in Fig. 5. This is an urban foundry employing men whose educational range is from less than the fourth grade to graduation from high school. The prediction of average hourly earnings from test scores in foundry "B" can be made with greater accuracy than in foundry "C" and indicates that the selection of molders through the use of such a measure as the discriminative dexterity test is immediately practical and efficient.

Conclusion

Results such as those reported in the foregoing demonstrate the feasibility of using a few short, easily scored and interpreted tests in the selection of employees, and in the screening out of those who do not have the potentiality for success.

The problems involved in the selection of foundry supervisors and foremen are so numerous, and proper selection so much more complex that information related to this procedure will be left for a later article.

FEF Announces 1949 Student Job Placement Program For Foundries

WITH THE END OF CURRENT COLLEGE TERMS NEARING, the Foundry Educational Foundation has launched its annual program of acting as liaison between prospective employers and students interested in obtaining either summer or permanent jobs in the nation's foundries. Simultaneously, FEF has announced that the Steel Founders' Society of America has been formally accepted as a founding member.

To facilitate contacts between employer and student, the FEF has distributed data sheets both to its member companies and to the students themselves. The employer states the type of students desired, whether for summer or permanent work, facts about his company, and sets times for interviews.

A feature of this year's FEF program is the publication of a list of educators who have been prominent in foundry educational work at the college level and who are active in serving as contacts between the foundry industry and the engineering student in placement work. They are:

*Prof. K. H. Donaldson, head, Department of Metallurgy, Case Institute of Technology, Cleveland, Ohio.

*Prof. Peter E. Kyle, College of Engineering, Cornell University, Olin Hall, Ithaca, N. Y.

Prof. Otto Zmeskal, director, Department of Metallurgical Engineering, Illinois Institute of Technology, Technology Center, Chicago 16, Ill.

*†Prof. Howard F. Taylor, Department of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

Prof. C. C. Sigerfoos, Division of Engineering, Department of Mechanical Engineering, Michigan State College, East Lansing, Mich.

†Dr. Daniel S. Eppelsheimer, Missouri School of Mines and Metallurgy, Rolla, Mo.

*Prof. Richard H. Cole, Northwestern Technological Institute, Evanston, Ill.

†Prof. Douglas C. Williams, Department of Mechanical Engineering, Ohio State University, Columbus 10, Ohio.

†Prof. Harry R. Dahlberg, School of Engineering and Industrial Arts, Oregon State College, Corvallis, Ore.

Prof. C. W. Morisette, Department of Industrial Engineering, Pennsylvania State College, State College, Pa.

Prof. Scott McKay, Rensselaer Polytechnic Institute, Troy, N. Y.

*Prof. E. C. Wright, Department of Metallurgical Engineering, University of Alabama, Tuscaloosa, Ala.

*Prof. John F. Kahles, Department of Metallurgical Engineering, University of Cincinnati, Cincinnati, Ohio.

†Prof. Harry Czyzewski, Department of Metallurgical Engineering, University of Illinois, Urbana, Ill.

†Prof. Fulton Holtby, Mechanical Engineering Department, University of Minnesota, Minneapolis 14, Minn.

Prof. C. R. Fitterer, head, Department of Metallurgical Engineering, University of Pittsburgh, Pittsburgh, Pa.

*Prof. G. J. Barker, chairman, Department of Mining and Metallurgy, University of Wisconsin, Madison, Wis.

†Prof. Lloyd G. Berryman, Department of Mechanical Engineering, A. & M. College of Texas, College Station, Texas.

*Foundry Educational Foundation Schools
†A.F.S. Student Chapter Schools

GRAPHITIZING BEHAVIOR OF WHITE IRON

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American Foundrymen's Society
Chicago

THIS RESEARCH COMPRISES a study of the graphitizing behavior of white iron of chilled car wheel composition, annealed at temperatures ranging from 1600 F to 2000 F so as to complete first stage graphitization. Annealing was conducted under conditions such as to practically eliminate initial graphitization while the metal was being heated from room temperature to the nominal temperature. The experimental results establish the approximate time required to complete first stage graphitization and the type of graphite formed as a result of first stage graphitization.

Experimental Procedure

Two white irons were selected for this investigation; the first a typical chilled car wheel iron and the second a relatively low total carbon white iron of malleable iron composition. The analyses of each of the base metals is as follows:

Composition, per cent	Chilled Car Wheel Iron	Low Total Carbon Malleable Iron
Total Carbon	3.50 to 3.60	2.45 to 2.55
Silicon	0.50 to 0.60	1.10 to 1.20
Manganese	0.50 to 0.60	0.35 to 0.40
Phosphorus	0.35 max.	0.14 max.
Sulphur	0.14 max.	0.12 max.

Typical photomicrographs of the white iron of chilled car wheel composition are shown in Fig. 1.

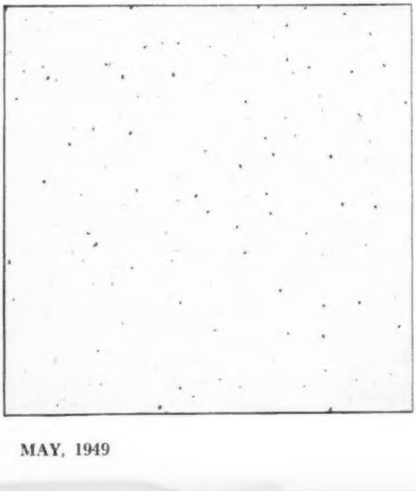
In order to minimize the length of time necessary to heat from room to nominal temperature, utilizing a high-speed abrasive cut-off wheel pieces of white iron $\frac{5}{16}$ x $\frac{3}{4}$ x $\frac{1}{16}$ in. thick were cut from the white iron castings whose original sections were of the order of $1\frac{1}{2}$ in. thick. At each of the temperatures, nine such specimens were annealed by submerging them in a bath of molten lead which had previously been heated to the nominal temperature desired. Thus the specimens were protected from oxidation and decarburization, and probably attained the nominal temperature of the molten lead bath in a matter of seconds. Each of the specimens was tied to a nichrome wire to facilitate their insertion and removal from the lead bath at the desired time intervals. The annealing temperatures studied were 1600, 1700, 1750, 1800, 1825, 1850, 1900, 1950 and 2000 degrees F.

The temperature of the lead bath was controlled by an automatic temperature controller, with a chromel-alumel thermocouple whose hot junction was immersed in the molten lead. When the lead bath had attained the desired temperature, the samples were immersed and held in the submerged position by plunging them under a block of iron fastened to the side of the lead pot so that its lower face was submerged approximately one in. under the surface of the lead bath. In each instance the specimens were progressively inserted into the lead at regular time intervals and removed at one time, after the desired time had elapsed. Each sample as it was withdrawn from the furnace was permitted to cool in air. Since the samples were very small and particularly because they were only $\frac{1}{16}$ in. thick, it was felt that they cooled sufficiently rapid to suppress any further graphitization beyond what had been accomplished at the desired nominal temperature.

The temperature utilized and the exact number of minutes to which each of the nine specimens was held at temperature, is recorded in Table I.

When the specimens had cooled to room temperature, they were cut in half and one piece of each sample mounted in bakelite in the conventional manner

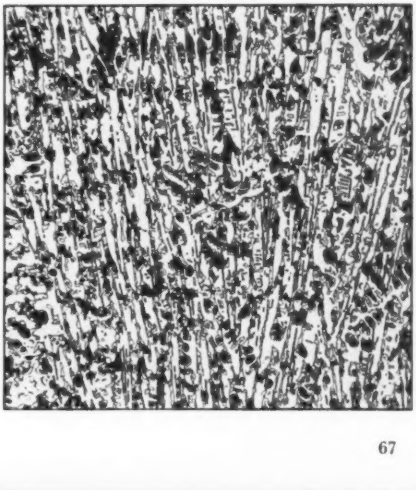
NOTE: This paper was presented at a Gray Iron Session of the 53rd Annual Meeting of the American Foundrymen's Society, at St. Louis, May 2-5, 1949.



Unetched X100

Fig. 1 – Typical chilled wheel iron, as polished and after etching

Etched 1½% Nital X100



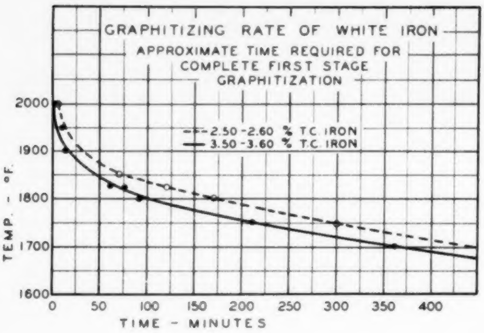


Fig. 2—Graph showing graphitizing rate of white iron.

for micrographic examination. Photomicrographs were taken to record the quantity and character of carbon which had precipitated. After etching with a 1½ per cent solution of concentrated nitric acid in absolute ethyl alcohol, the samples were examined for completion of first stage graphitization, as evidenced by the absence of primary cementite. The sample annealed the minimum length of time showing complete first stage graphitization, was then photographed to obtain a permanent record. Thus, this procedure made it possible to determine the quantity and character of carbon precipitated, as well as the minimum length of time necessary to accomplish complete first stage graphitization at a given annealing temperature.

Experimental Results

A. Chilled Car Wheel Iron: Utilizing the procedures outlined, the approximate time required to complete first stage graphitization of a typical chilled car wheel iron is recorded in Table 2.

These values have been plotted in Fig. 2, in which annealing temperature is recorded on the vertical axis and time at annealing temperature in minutes on the horizontal axis. It should be noted that the observed points lie in a relatively smooth curve and that the time required to complete first stage graphitization decreases from approximately 1000 min at 1600 F to as short a time interval as 2 min at 2000 F. The latter temperature, of course, is only about 100 degrees below the fusion temperature of the metal.

A complete photomicrographic record of the quantity and character of carbon precipitated, as well as the absence of residual primary carbides, is recorded in Figs. 3 to 11, inclusive. The photomicrographs are in pairs, showing the unetched and etched structure of the metal at each of the nominal temperatures studied, and in all cases represent the condition found in the specimen which exhibited complete first stage graphitization in the minimum time at a given temperature.

It is interesting to note that the carbon precipitated progressively changes from a nodular type to one which is nodular and contains exfoliation from the nodule, and then progressively into an increasing quantity of typical flake graphite, until all of the carbon is of the flake type, characteristic of gray iron. At approximately 1800 F a pronounced transition appears to be taking place in which the nodular type of graphite is being wholly replaced by the flake-like form. During the transition period, the flakes are inclined to be shorter but thicker and, as the annealing temperature approaches 1900 F and above, they have a well-defined flake outline, characteristic of gray iron. The matrix of the metal in all instances is very fine lamellar pearlite not clearly resolved at this relatively low magnification.

When annealing is conducted at temperatures ranging from 1900 to 2000 F the resulting metal is typical of a gray iron, cast from metal of identical composition, but under conditions in which the metal cools slowly enough to permit the carbon to precipitate and yield a gray iron. Figure 12 is a photomicrograph at X100 of such an iron after etching with 1½ per cent nitric acid in absolute alcohol. Comparison of the structure disclosed in Fig. 12 with that in Fig. 11 reveals only one difference; namely, that there is better distribution of graphite and the graphite flakes are much finer.

Physical Properties: It is of further interest to note that when bars of white iron of the same composition were annealed at 2000 F either by submerging them in molten lead at this temperature, or heating by means of high frequency induction for the prescribed time interval recommended in Table 1, and then air cooling, the tensile strength of the metal is consistently about 15,000 psi. It is believed that this relatively high tensile strength for an iron having a moderately high total carbon is attributable to two factors: (1) the relatively fine and well-distributed graphite structure, and (2) the fine pearlitic matrix which resulted from air cooling the bar after first stage graphitization had been completed.

B. Low Total Carbon Iron: Utilizing identical procedures, samples were cut from a low total carbon iron

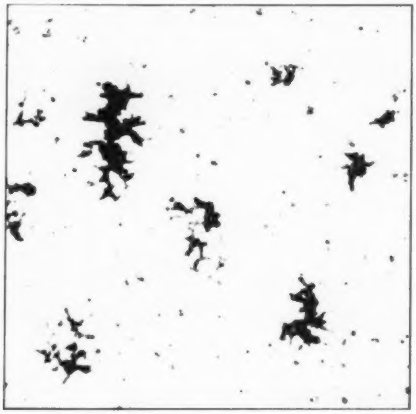
TABLE 2—APPROXIMATE TIME REQUIRED FOR FIRST STAGE GRAPHITIZATION AT INDICATED TEMPERATURE (CHILLED CAR WHEEL IRON)

Graphitizing Temperature, F	Time, min
1600	900-1080
1700	360
1750	210
1800	90
1825	60
1850	60
1900	12
1950	11
2000	2

TABLE 1—TIME AT TEMPERATURES IN MINUTES FOR VARIOUS TEMPERATURES USED IN GRAPHITIZING TESTS ON WHITE IRON (CHILLED CAR WHEEL IRON)

Sample No.	Temperature, F								
	1600	1700	1750	1800	1825	1850	1900	1950	2000
1	120	60	60	30	15	10	6	4	2
2	180	120	90	50	30	20	8	6	3
3	240	180	120	70	45	30	10	8	4
4	300	240	150	90	60	40	12	10	5
5	420	300	180	110	75	50	14	11	6
6	540	360	210	130	90	60	16	12	8
7	720	420	240	150	105	70	18	13	10
8	900	480	270	170	120	80	20	14	—
9	1080	—	300	190	135	90	22	15	—

Influence of Annealing Time and Temperature on Chilled Iron



Unetched
X100

Fig. 3—18 hr at 1600 F.

Etched 1½% Nital
X250

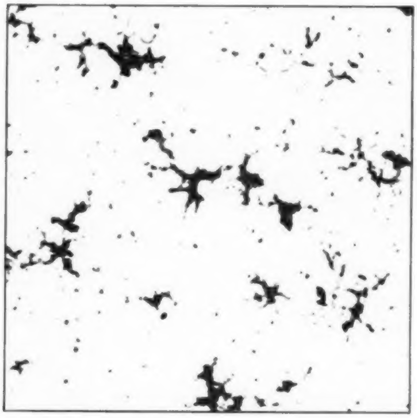


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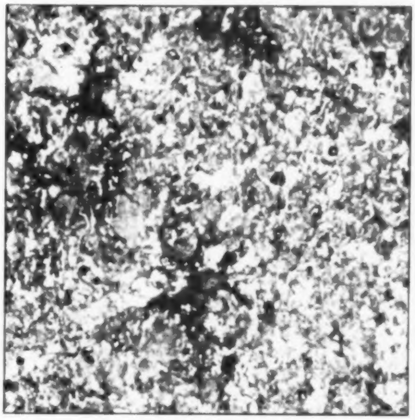
Fig. 4—8 hr at 1700 F.

Etched 1½% Nital
X250



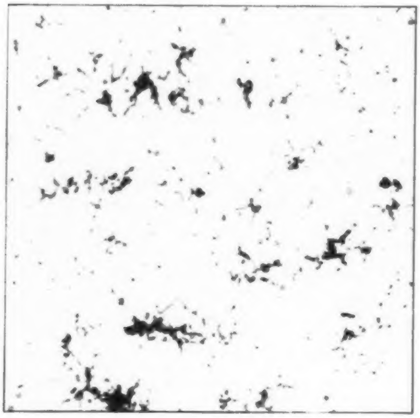


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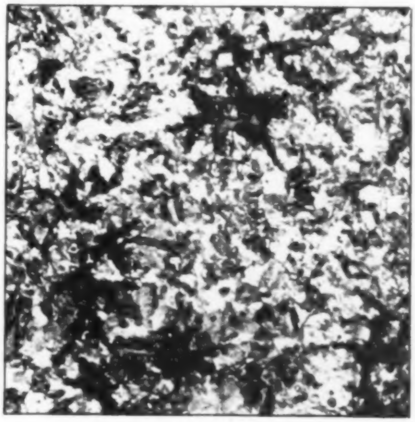
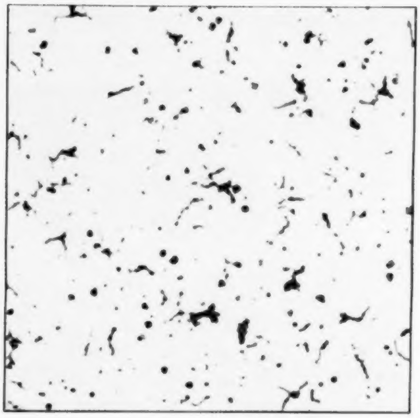
Fig. 5—5 hr at 1750 F.

Etched 1½% Nital
X250

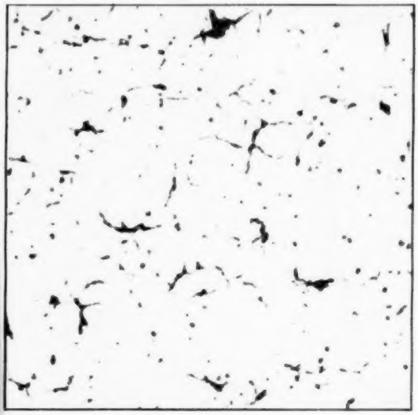




Unetched
X100

Fig. 6—1½ hr at 1800 F.

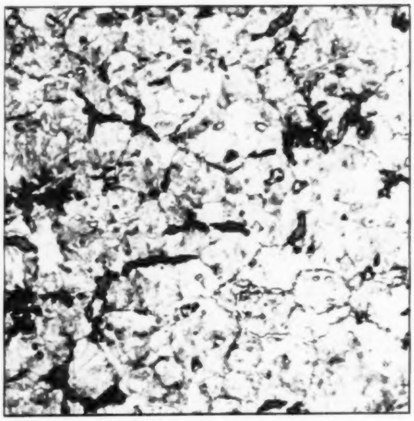
Etched 1½% Nital
X250

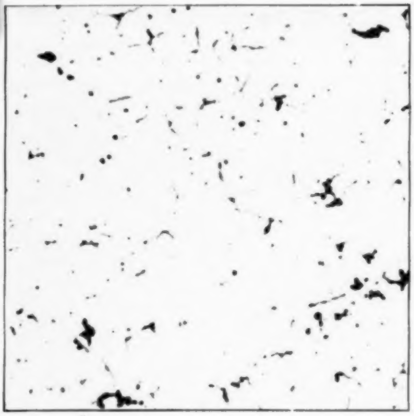


Unetched
X100

Fig. 7—1 hr at 1825 F.

Etched 1½% Nital
X250

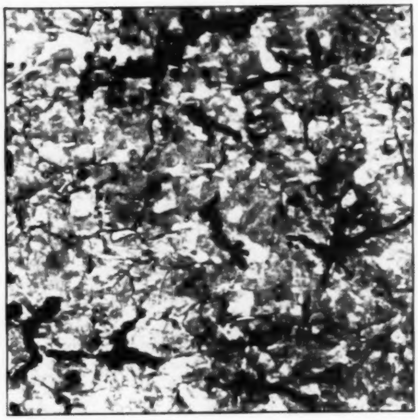




Unetched
X100

Fig. 8—1 hr at 1850 F.

Etched 1½% Nital
X250



Influence of Annealing Time and Temperature on Chilled Iron

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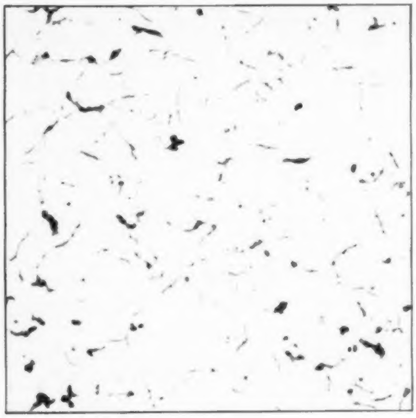

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Fig. 9—22 min at 1900 F.

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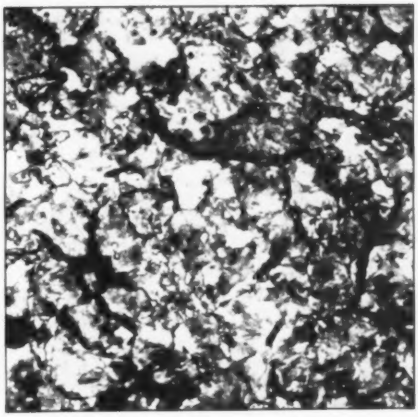

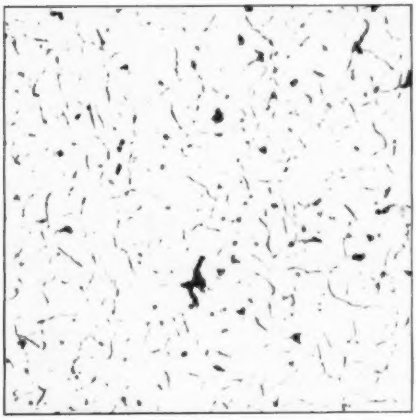

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Fig. 10—15 min at 1950 F.

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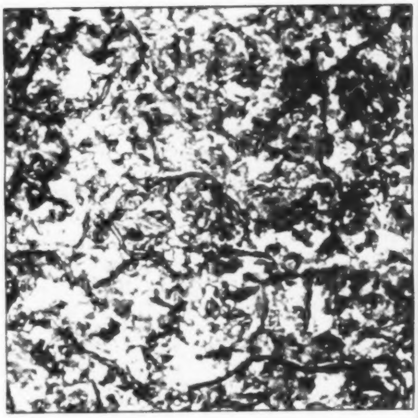

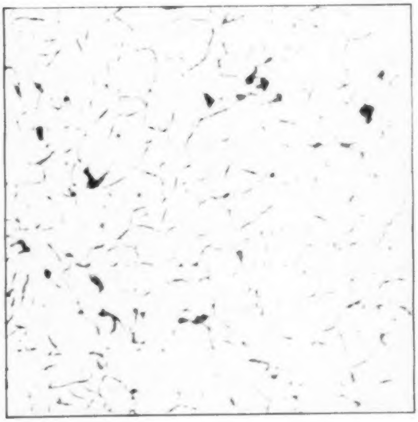

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Fig. 11—10 min at 2000 F.

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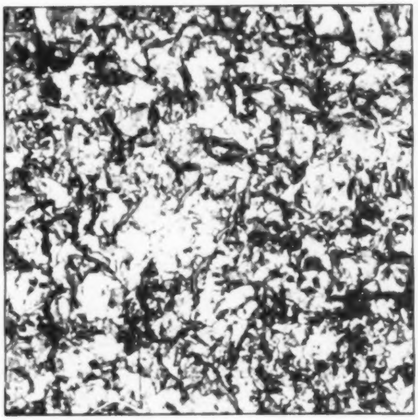


Table 3—Time at Temperatures in Minutes for Various Temperatures Used in Graphitizing Tests on White Iron (Low Total Carbon Content Iron)

Sample No.	Temperature, F							
	1700	1750	1800	1825	1850	1900	1950	2000
1	60	60	30	15	10	6	4	2
2	90	90	50	30	20	8	6	3
3	120	120	70	45	30	10	8	4
4	150	150	90	60	40	12	10	5
5	180	180	110	75	50	14	11	6
6	210	210	130	90	60	16	12	8
7	240	240	150	105	70	18	13	10
8	270	300	170	120	80	20	14	—
9	300	—	190	135	90	22	15	—

of typical malleable composition and were subjected to graphitizing tests at temperatures ranging from 1700 to 2000 F. The only difference in the test was the matter of time interval which, of necessity, had to be increased because of the slower graphitizing rate of the low total carbon white iron. The results of these tests are recorded in Table 3.

To avoid repetition photomicrographs are not included for the low total carbon material, since examination disclosed that the behavior was identical with that of the higher carbon material previously described, except that the time element was materially increased due to the greater resistance of the low carbon iron to first stage graphitization. The approximate time involved to complete first stage graphitization at the various temperatures employed is recorded in Table 4, and the experimental results have likewise been plotted in Fig. 2.

The graphite obtained at temperatures ranging from 1700 to 1800 F was a typical temper carbon. Progressively, as the temperature was increased above this point, the nodules became elongated and, passing through a gradual transition, the carbon acquired a typical flake graphite form at temperatures from 1900 to 2000 F.

Conclusions

From the foregoing, it is evident that there is a marked difference in the type of graphite precipitated within the limits investigated, dependent upon the temperature at which first stage graphitization takes place. This change ranges from a true temper carbon, typical of malleable iron, to one of distinct flake form, characteristic of gray iron. Likewise, as the temperature rises, first stage graphitization progresses at an increasing rate, requiring so short a time interval as 2 min when the annealing temperature is 2000 F.

It is believed that there are instances where this

Table 4—Approximate Time Required for First Stage Graphitization at Indicated Temperatures (Low Total Carbon Iron)

Graphitizing Temperature, F	Time, min
1700	Incomplete at 300 min
1750	300
1800	170
1825	120
1850	70
1900	Incomplete at 22 min
1950	Incomplete at 15 min
2000	6

method of indirectly producing a gray iron may find application. The practical accomplishment under plant conditions offers some obstacles, such as rapid surface oxidation or scaling when metal is heated to these high temperatures, requiring an atmosphere controlled furnace. Distortion of the casting at these high temperatures may make it impractical where final dimensions are of primary importance. Also, it must be remembered that furnaces operating at these high temperatures involve the use of premium quality refractories and entail relatively high operating and maintenance costs. In certain isolated cases, where sections are symmetrical, such as a cylinder or a tube, the casting may be heated quickly and relatively economically by use of high frequency induction.

The author does not feel that this investigation discloses any particularly new or novel information, but

Fig. 12—A typical graphite structure obtained when iron of chilled car wheel composition is cast in sand and sections are heavy enough so that the resulting structure is gray iron. As polished. X100.

that it is a study of graphitizing behavior at increasing temperatures which should be of interest to the foundryman.

Acknowledgment

The writer wishes to express his appreciation to the Association of Manufacturers of Chilled Car Wheels for permission to publish this work, since the research was conducted while the writer was in the employ of this organization. Credit is likewise due Dr. R. W. Lindsay and Mr. H. Hursen, who actively assisted in the prosecution of this research.

Old-Timers Get New A.F.S. Dues Rate

Memberships of men who have retired from active service in the foundry industry may be continued at a dues rate of $10.00 per year. This recent ruling of the A.F.S. Board of Directors permits old-timers to continue to receive American Foundryman and other Society literature, attend chapter meetings and keep in touch with old friends.

OPERATOR KNOW-HOW PROLONGS ELECTRIC FURNACE LINING LIFE

John Tjemmes
General Foreman
American Brake Shoe Co.
Elyria, Ohio

SKILLED MANIPULATION OF HEATS AND SLAGS on the part of electric furnace operators can considerably prolong the life of roof refractories in spite of the unusually heavy punishment inflicted on furnace roofs by the use of bulky scrap.

Offsetting Effects of Bulky Scrap

Many shops have been forced by low inventories to accept any obtainable type of scrap, with the result that charges become unusually bulky due to light scrap necessitating back charging or recharging. This means that roof refractories are brought into close contact with the arc two or three times, instead of once during each heat. Operators can remedy this situation to some degree by starting each heat and recharge on the second or third tap, rather than on the highest tap. If this is done for a few minutes, the electrode ends will have buried themselves in the scrap and high-tap operation can be resumed without subjecting roof refractories to an unnecessary amount of heat.

Careful Charging Prevents Trouble

Although physical characteristics of the charge are the source of much bottom trouble, much of this can be avoided by careful makeup of charges. By segregating more of the solid, heavy scrap and placing it at the bottom of the charge, the operator can avoid bottom boring by the electrodes. If the charge is unusually bulky, the operator can use his highest tap and reduce ampere load at about the time the electrodes have bored through the entire mass. If the reduced load is maintained until a small bath has been started, bottom erosion can be minimized.

There are many ways in which the operator can manipulate heats and slags so as to have a tremendous effect on refractory life. Although these skills are developed largely through experience, sound instruction in the fundamentals of electric furnace operation by supervisors can be of great help in prolonging the life of electric furnace refractory materials.

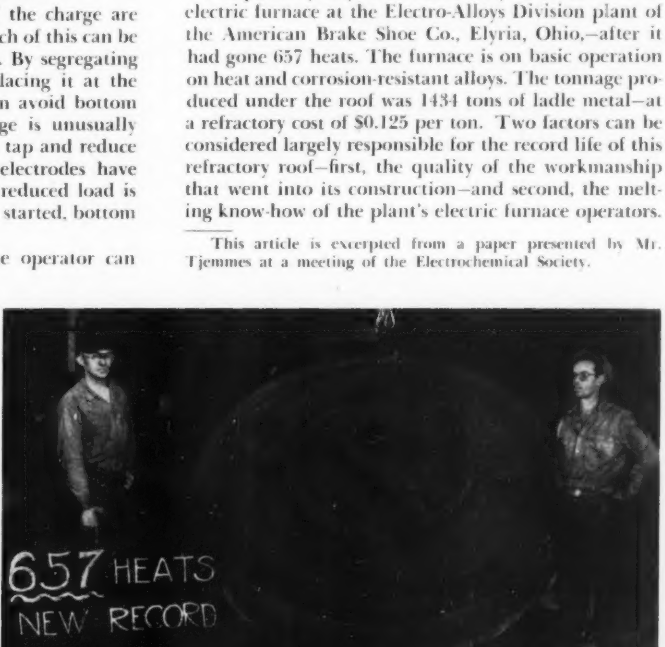
One of the most important steps in good electric furnace operation is the selection of the proper taps for use in various stages of the heat. A given bath of molten metal can absorb heat only at a given rate, and the use of taps with higher voltages than necessary can only result in faster destruction of refractories.

Clay Roof Goes 657 Heats

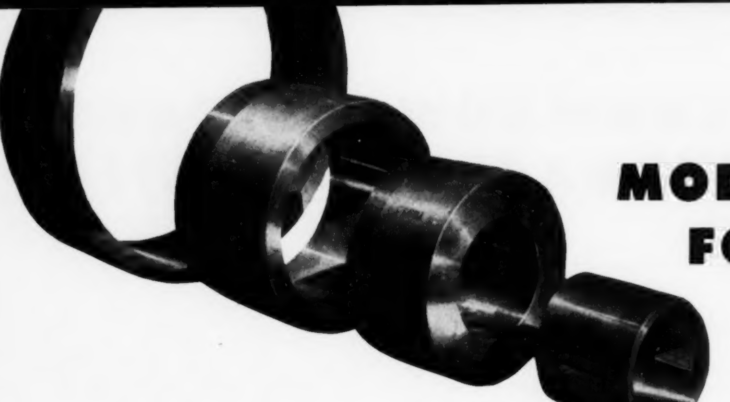
The average quality of brickwork today is somewhat lacking—especially in the building of roofs. Particular care in the making of good joints and provision for proper expansion are vital factors in the construction of good silica roofs. In the building of super-duty clay roofs, it is especially important that all joints be well mortared with a high grade mortar.

A super-duty clay roof was recently removed from an electric furnace at the Electro-Alloys Division plant of the American Brake Shoe Co., Elyria, Ohio,—after it had gone 657 heats. The furnace is on basic operation on heat and corrosion-resistant alloys. The tonnage produced under the roof was 1434 tons of ladle metal—at a refractory cost of $0.125 per ton. Two factors can be considered largely responsible for the record life of this refractory roof—first, the quality of the workmanship that went into its construction—and second, the melting know-how of the plant's electric furnace operators.

This article is excerpted from a paper presented by Mr. Tjemmes at a meeting of the Electrochemical Society.



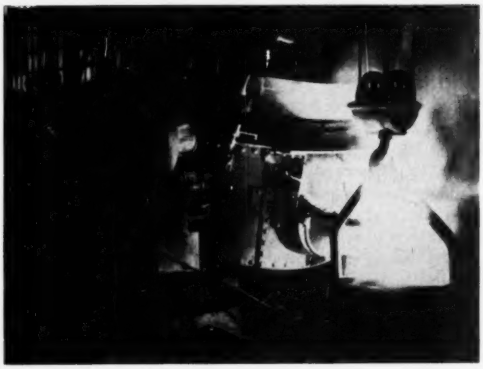
Author John Tjemmes, general foreman, left, and Furnace Operator Donald Harley of the Electro-Alloys Division of the American Brake Shoe Co., at Elyria, Ohio, stand beside the refractory roof of an electric melting furnace, which was removed recently after a record-breaking run of 657 heats.

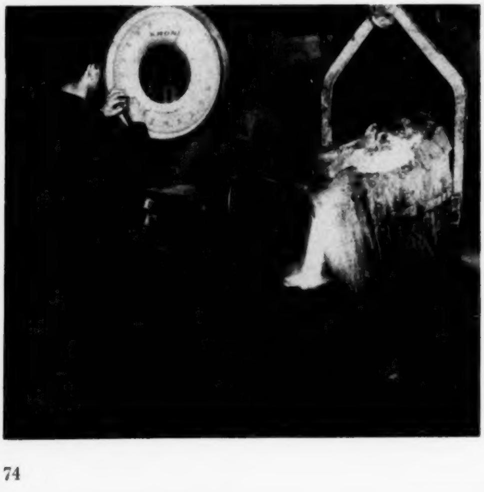


MODERN FOUNDRY METHODS

Methods for mass production of high alloy steel cylinders for jet engine turbine rings by the centrifugal casting process in permanent molds have recently been developed by The Cooper Alloy Foundry Co., Hillside, N. J. The highly critical cylinder castings range from 8 to 30 in. in diameter and weigh from 30 to 500 lb. In the typical examples shown (left, above) the large ring is 27 5/8 in. O.D. and weighs 450 lb as cast.

An electric furnace is used for melting the heat-resistant steel alloy (left and below), and the specified composition of 24 per cent chromium, 12 per cent nickel, and 3 per cent tungsten is carefully maintained under quality melting standards.





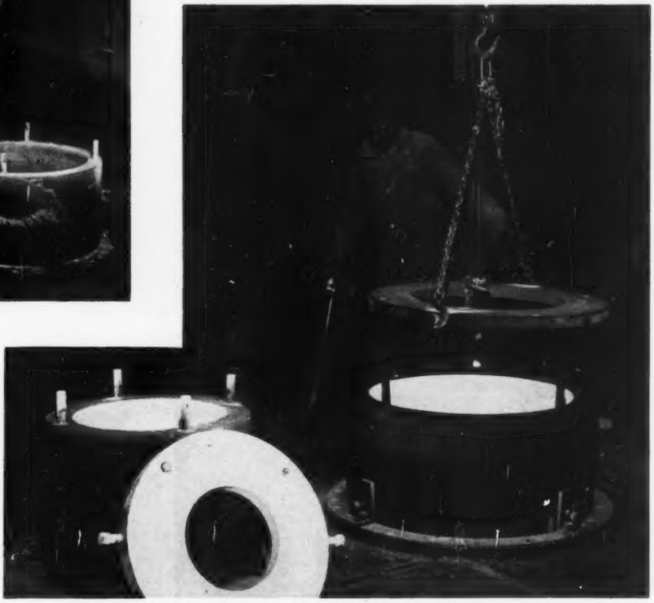
In the true centrifugal method the outside diameter of the casting is fixed by the metal mold, while the inside diameter is dependent upon the amount of metal poured rather than on a core. Therefore, it is necessary that rigid weight control measures be established. The metal is tapped from the furnace into a large ladle, and is then poured into a smaller ladle and weighed (left).

Relationships between the weight of metal poured and the wall thickness of the casting have been established from tabular data obtained from a series of experiments. Variations in the inside diameter of the casting are dependent upon the speed of rotation, and the specific speeds (200-600 rpm.) required to obtain uniform wall thicknesses were obtained from experiments.

...MODERN FOUNDRY METHODS

⬅ Cleaning the mold with compressed air through a blow pipe before spraying with silica wash.

⬇ Assembling molds and covers. Mold walls and covers have been sprayed with silica wash. The mold bottom is not sprayed, and is protected by a machined steel plate which, in case of fusing, will be removed with the casting.



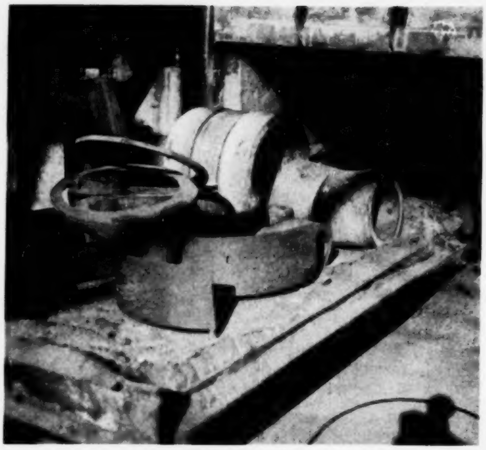
In pouring the molten metal directly against the bare metal mold wall it was found that the chilling of the outer surface and its rapid contraction resulted in the appearance of large cracks which ran vertically the full height of the casting.

In order to retard the initial chilling action it was decided to spray the mold walls with a fine silica wash. It was found that as the wash thickness increased the tendency toward cracking decreased.

⬅ Pouring a weighed amount of molten high alloy steel into a spinning mold.

⬇ Hot castings are removed from the metal molds by specially designed tongs, and processed as described on the following page.

MODERN FOUNDRY METHODS...

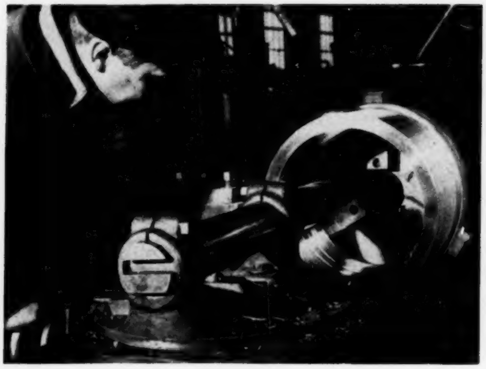


After removal from the mold most of the thin fin of metal covering the bottom of the casting is removed by powder burning with an oxygen torch (above, left). The contact area of the fin and the casting is then smoothed with a swing grinder (above).

Heat treatment (left) to obtain the desired physical properties is the next step in the process.

Prior to x-ray examination in the foundry x-ray department the castings are turned on a lathe to remove rough surface scale. Those castings with wall sections too thick for effective x-raying are subject to gamma-ray inspection.

The rough castings, having met all foundry and laboratory requirements, are shipped to the aircraft plant for the final machining into the jet engine components. After machining the parts receive a final x-ray inspection.



FOUNDRY TECHNICAL CENTER OF FRANCE RESTORES A WAR-TORN INDUSTRY

ADVANCEMENT OF FRENCH FOUNDRY TECHNIQUE in recent years has been due largely to the work of France's Centre Technique des Industries de la Fonderie (Technical Center of Foundry Industries), created as an offshoot of several French foundry societies in 1945 as a means of restoring that nation's war-torn foundry industry to its rightful place in France's economy.

Devised by the country's leading foundrymen and visualized before the war as the only way in which the French foundry industry could attain a level of production compatible with its importance, the Technical Center is a clearing house for technical information and personnel and is empowered by the foundry industry to make trade agreements, to mediate between bargaining groups, and to establish sales practices.

Foundry Groups Combined

Forerunners of the Technical Center were the General Syndicate of French Founders (founded in 1897), which groups all phases of the foundry division into nine divisions, each under the guidance of one of the country's foremost specialists in that particular field; the Technical Foundry Association (founded in 1911), whose work is similar to that of the American Foundrymen's Society in that it is solely concerned with foundry technical progress; and the Foundry High School (founded in 1923), established by the General Syndicate of French Founders and which graduates engineers for the foundry industry each year.

While each of these organizations in itself was of immeasurable benefit to the industry, none was sufficiently influential to act as spokesman for the entire French foundry industry. After the war, when the French foundry industry took careful stock of itself, its shortcomings were evident: (1) Much of the industry had been destroyed by the war; (2) During the German occupation, progress in France was at a standstill, with the result that technical developments in other nations far outstripped those of France; (3) The French foundry industry, on the whole, was made up of hundreds of small foundries, most of them employing less than 20 workers.

Individual Research Limited

This predominance of small enterprises that could not, by reason of the closeness of their budgets, assume the financial burden of extensive research individually has been and still remains one of the major weaknesses of the French foundry industry. Of a total of 1800 foundries existent in France in 1938, only 10 per cent employed 100 or more persons. In 1948, a survey showed that of 2400 foundries, 60 per cent had less than 20 workers, 30 per cent from 20 to 100 workers, and less than 10 per cent employed from 100 to 500 workmen.

It is obvious that the very few foundries employing more than 500 people and capable of competing with the technical advances of large foreign foundry enterprises, were not in themselves sufficient to raise the entire French foundry industry to a high technical level of operation.

In answer to this vital problem, the most eminent foundry executives and engineers in France conceived the idea of the French Foundry Technical Center—a high-level policy organization combining the best of the nation's technical and managerial talent, which would serve the industry as a clearing house for information and which would at the same time be a more powerful protagonist for the French foundry industry than any of its component organizations.

Prominent among foundrymen who organized the Technical Center in 1945 were M. Norguet, general engineer, then director of French mechanical, electrical and foundry industries; Maurice Olivier, president of the General Syndicate of French Founders; and Pierre Ricard, first vice-president of the General Syndicate of French Founders.

Aids Foundries After War

The idea of the Technical Center was conceived and the groundwork laid during the war, in spite of the presence of German Occupational Forces, and in 1945, the Center was prepared to aid foundries in solving the problems posed by the lack of raw materials of good quality.

The precepts upon which the Technical Center was founded, as defined in its charter as an autonomous organization, are:

1. To conduct research into technical developments leading to improvement of castings quality.

2. To restrict the country's castings production by the establishment of norms and rules permitting quality control.

3. To aid, coordinate and raise the level of private initiative in the castings industry.

4. To disseminate latest developments in technical knowledge of the foundry industry, and to make available any information on the emergency repair of foundry equipment.

The Technical Services branch of the Center endeavors to assist French foundries in reorganizing, modernizing, and in choosing the best of available materials. To this end, it has coordinated the tech-

nical knowledge of its component organizations, makes it available for the rapid solution of the problems of the individual foundry, and lays the foundation for longe-range technical research.

The Technical Services branch is divided into eight specialized departments for handling problems that arise in cast iron metallurgy, steel metallurgy, copper alloys metallurgy, aluminum and magnesium alloys metallurgy, raw materials, equipment, surface conditions, and heating apparatus. Each of these specialized branches is directed by an engineer highly qualified by his theoretical and practical knowledge of the subject. These engineers offer their services in response to the specific requests of foundries for aid in overcoming casting problems, often working in the foundry itself to approximate working conditions more closely.

Technical Service Expands

Consultations offered by the Technical Branch began in 1942, three years before the official chartering of the French Foundry Technical Center. In 1942, its technicians were consulted on an average of 38 times each month by foundries on casting problems; in 1943, 68 times; in 1944, 53 times; in 1945, 96 times; in 1946, 151 times; in 1947, 257 times; and during 1948 more than 400 times—proof of the constantly growing acceptance of the Technical Center.

The Technical Center's consulting engineering specialists have made some 2500 visits to foundries throughout France, and are frequent speakers at technical society meetings all over the country. In addition, they conduct extensive researches into various phases of the castings industry.

As an example of these research projects, the Raw Materials Division of the Technical Center recently completed a nationwide survey of the location and characteristics of France's foundry sand deposits. The findings of this survey have been made available to all of the nation's foundries, and as a result, for the first time in the history of the French castings industry, foundries now have comprehensive, authoritative knowledge of where to find the best and most economical sands for their use. Although the report has been available for only a few months, many foundries report that they have cut their sand costs drastically, either because they have found a sand more applicable to their type of castings, or because they have discovered that the sand they have been ordering from clear across France is available a short distance away.

Decentralized Consulting Service Planned

The task of the Technical Center's consulting engineers is today particularly heavy, despite capable assistance from their staffs. To relieve these men of part of their burden, the Technical Center is contemplating the establishment of regional consulting offices, which would handle such problems as would not require intensive research into their solution. Thus only the most complex problems would be handled by the main offices in Paris.

All long-range research into foundry and metallurgical problems is under the Technical Center's Director of Research, whose department has recently completed or is currently undertaking some 63 separate investigations. Among those now completed are studies relating to the influence of chromium in the annealing of blackheart malleable cast iron and comparative studies of foreign and domestic blackings.

Now in process are researches into such subjects as the sensitivity of cast irons to changes in section and to inverse chilling, shrinks and micro-shrinkage cavities in light alloys, degasification and aluminum removal during the melting of brass and bronze, and the weldability of carbon steels.

While the Director of Research is at present using the laboratory facilities of universities and privately-owned foundries in addition to those of the Technical Center, construction of a special laboratory and test foundry at the Technical Center is planned for the near future. Technical Center laboratories, headed by competent specialists, are devoted to chemistry, physics, mechanical tests, sand tests, heat treating, surface and lining research, and heating apparatus research.

In addition to those located at the Technical Center in Paris, regional laboratories have been established at Bordeaux, Charleville, Lyon, Nancy, Roubaix and St. Dizier, and others will shortly be put into service at Marseille, Rouen and Rennes. These laboratories have been established on a cooperative basis with foundries in their respective regions and are financially independent of the Technical Center. Thus, each laboratory is equipped to deal with the foundry problems encountered in its particular region, as in the case of the laboratory at Charleville, which devotes most of its research to solving the problems of the many foundries in its area producing cooking utensils and domestic heating apparatus.

Research Receives Full Industry Support

The entire French foundry industry is sponsoring the research work of the Technical Center, which is supervised by an Executive Technical Committee made up of the foremost foundry technicians and metallurgists in France. The Committee is headed by the General Director of the Technical Center, and its membership is made up of the directors of the various Commissions (Divisional Committees), the president of the Technical Foundry Association, and the president of the Scientific Commission.

The role of this Executive Committee in Technical Center research is to diagnose technical problems, and to coordinate and develop research into their solution. In addition, the Committee conducts researches into such industry problems as affect the entire French industrial economy.

Working directly under the Executive Technical Committee and the General Director are the Commissions, representing steel, aluminum and magnesium, brass and bronze, gray iron and malleable iron.

A Scientific Commission has been appointed to insure effective liaison between scientific theory and its practical application to the foundry industry. Many of France's most prominent metallurgists participate in the work of this Scientific Commission.

The Mixed Commissions (corresponding to A.F.S.

general interest committees) function in such fields as automotive founding, hydraulics, laboratories, ingot molding, and methods and equipment. Other Mixed Commissions—such as that on Naval Constructions—are organized or disbanded as needed.

The Commissions work closely with the French National Bureau of Standards and with the French Association of Standards, in establishing foundry standards. Among those accepted by the Government to date are standards on malleable iron castings, copper alloy castings, combustible solid minerals, and aluminum kitchen utensils. There are now approximately 120 specifications in preparation relating to non-alloyed steel castings, gray iron castings and light alloy castings.

The various regional branches of the Technical Center have, at the request of the foundries they represent, established regulations affecting the quality control of castings. The Commerce Commissions empowered to set up these regulations base them on existing standards and patent rights and subject all products to exhaustive tests. If a product meets all tests satisfactorily, the Commission awards the manufacturer the right to use its seal of approval on the product.

There are at present three types of approval seals awarded by the Commerce Commissions: NF-UFACD—for domestic cooking and heating apparatus; AF-FOMA—for malleable iron products; and ALUFRAN—for kitchen utensils of light alloys. Creation of seals of approval for cast iron products and light alloy castings are planned for the near future.

New Developments Are Publicized

As a means of spreading new ideas on foundry techniques, the Technical Center's Bureau of Documentation has been formed. Its purpose is to investigate and publicize new foundry developments that are of interest to French foundrymen. This Bureau employs a group of linguists who translate articles from foreign technical publications.

Another Bureau, the Editorial, publishes and circulates all technical papers judged worthy of dissemination to foundrymen. The Editorial Bureau's chief task, however, is publication of the internationally-known technical journal, *La Fonderie*. It also publishes a magazine containing abstracts of technical articles on gray iron, steel, copper alloys and light alloys castings.

Working in conjunction with the Bureau of Documentation and the Editorial Bureau is the Bureau of Publications, which issues reports on the various researches conducted by the Technical Center.

Headed by president Pierre Ricard, assisted by two vice-presidents, an Administration Council directs policies of the French Foundry Technical Center. The 12 members of the Council are named by decree of the French Minister of Commerce and Industry and represent management, technical and educational phases of the foundry industry.

The general direction of the Technical Center is assumed by General Director Le Thomas, assisted by two administrative services—the General Secretariat and the Bureau of Accounting and Statistics. As a result of its work in improving the nation's foundry industry, the Technical Center has received the sanction of the French Government, and on July 22 of last year, the President of the Republic of France issued a decree officially authorizing its functions.

Artist's drawing of the ultra-modern structure planned to house all the facilities of the French Foundry Technical Center at sometime in the future. Rapid expansion of the Center has recently necessitated the removal of a large part of its facilities to a second location in Paris. When the edifice pictured here is completed, all of the French Foundry Technical Center's administrative offices and technical departments will be housed under one roof.

According to the text of the President's decree, the French Foundry Technical Center enjoys administrative and financial autonomy within a framework of control exercised by the State. Its resources are obtained from an obligatory tax levied on the capital of the nation's foundries.

In order to guarantee a maximum of personal initiative on the part of France's foundries, a portion of this tax may be exempted by the foundry for the financing of individual foundry research. However, these individual research projects are subject to approval of the Technical Center.

The growth of the Technical Center has been so rapid during its brief existence that it has been necessary to transfer some of its facilities to a second location in Paris. While construction is now in process at the second location to house overflow facilities, it is planned that all facilities will be reunited under one roof at some time in the future.

Questions

THE ROUND TABLE

Answers

PRESENT APPRENTICE TRAINING VIEWS

First of a series sponsored by *American Foundryman*, this month's Round Table reports the informal discussion of a small group of Canadian foundrymen who assembled in Montreal, Que., to consider a perennial foundry problem—apprentice training. Meeting for dinner and discussion as guests of "The Foundrymen's *Own* Magazine," these men—active in training work in their own plants and on chapter and national educational committees—talked over their problems and practical methods of solving them. Conversation is as recorded, complete with training details applicable in many foundries and differences of opinion on suitability of various training practices.

E. N. Delahunt: Apprentice training is the subject of this first Round Table, to be recorded and published in our own magazine, American Foundryman. To get the meeting under way, I am asking Henry Louette to outline the need for apprentice training in a mechanized cast iron production shop.

Henry Louette: A mechanized foundry needs apprentice foundrymen who, after four years of training in the various departments of the plant, can be placed in the departments which need them and which suit them best. A mechanized foundry may not need apprentice molders since most of the work is done by machines and the men require comparatively little attention after they have been instructed properly.

One definite advantage of having an apprentice training program in a mechanized foundry is its effect on company morale and community relations. Such a program stimulates general interest in the community because it shows the interest we take in the young fellows in our plant.

Training Program Has Waiting List

One of the problems we encountered first was in selecting our young fellows. After several years of operation we find they come in naturally from various points in the plant where we employ young lads—shipping room, office, cafeteria—and through our employees who spread the word to their sons or other relatives. We now have a waiting list of young fellows who want to take our training program.

E. N. Delahunt: You might outline the program.

Henry Louette: An apprentice starts with six months in the Sand Control Laboratory, then is on Cupola for three months, Shipping for three months, General Core and Radiator Core 12 months, and General Foundry for 12 months, which makes a total of 36 months. At the end of each stage, the department foreman writes a report which is attached to the transfer card that follows the apprentice from one department to another. Thus, when the apprentice has completed his third year and moved up to the Improver Class, the record includes statements on any exceptional ability shown.

An apprentice having finished three years without showing enough ability to become a journeyman is transferred into some classified work and does not follow the Improver Class.

Each apprentice is expected to follow evening classes at each term conducted at the Technical School throughout the four years for theoretical and practical instructions which he can not acquire in our own plant. All apprentices' time is recorded in the Experimental Department.

E. N. Delahunt: In other words, their time is charged out to the Experimental Department, and the foremen of the various departments are not burdened with the boys' time. The purpose of this arrangement is to prevent the foremen from placing the young lads on piece work jobs in an effort to keep department costs in line and also to eliminate the possibility of losing an apprentice because of the increased earnings possible on a piece work job.

Henry Louette: The supervision and responsibility of our program is under the head of the Experimental Department and the apprentices in the various departments are entirely responsible to him. We have 600 employees and start two apprentices per year. This does not include our program for the Pattern Shop which is separate but somewhat similar.

E. N. Delahunt: That is a brief outline of one plan, as worked out by Henry, who has done a lot of work on the Educational Committee of the Eastern Canada and Newfoundland Chapter. Now, I'd like to ask Reg Williams, who has done considerable educational work in the Ontario Chapter, to give us his ideas.

R. H. Williams: I think you have to decide whether you want all-around foundrymen or mechanics. Henry Louette has taken a stand for the mechanized foundry,

saying he wants all-around foundrymen. Our plant is partly mechanized and we do a lot of jobbing work too where we require craftsmen.

To get around this difficulty, we have taken on trainees to become mechanics and assign them definitely to the departments in which they are to work. We have trained molders and core makers this way and in a couple of years these chaps do a pretty good job. This is something we have just done the past few years even though we have a four-year apprentice course.

The Ontario Chapter, for the past three years has sponsored lectures at the Technical School in theory and practice of foundry work. Most of the students who attend these courses are not apprentices in the strict sense. They are people working in the foundry, anywhere from 16 to 60, who want to further their knowledge, and they seem to gain quite a lot.

This year eight special lecturers gave three lectures each on some phase of foundry work. The subjects for the 1948-49 course in Hamilton were: molding sands; core sands and cores; pattern making; non-ferrous metallurgy; cupola operation; iron metallurgy and control; and casting defects. Three lectures were given, one a week, on each of the subjects, and on a second night a week there was a course in molding.

Generally speaking, I feel a lot of our apprentice systems are out-moded (AMERICAN FOUNDRYMAN, October, 1948, page 60). I don't say Henry Louette's is by any means. But I know of some foundries where they will bring a young chap in as an apprentice, put him in a department and for some weeks he is nothing but an errand boy. He doesn't learn anything.

If the molder is on piece work he doesn't want to be hampered with somebody getting in his way and having to explain everything he does. That is one system of training an apprentice—bringing him along. If he manages to stay four years he may get a little bit of foundry know-how.

It seems to me that if we are going to train young chaps we should make a real business of it, and set up a practical foundryman or molder to teach these fellows how to do these things and not leave it to chance. Mechanics can be trained in less than four years but if you want an all-around foundryman, four years is little enough

E. N. DELAHUNT: Within the past year or so we have instituted a comprehensive apprenticeship plan. The idea, I think, originated in some of our chapter meetings here. As Reg says, it is difficult to get apprentices. We have set out to encourage the grammar schools in the neighborhoods where the factories are located to glamorize the foundry industry.

Starting with lads 13 and 14 years of age we bring them into the shop to show them what sort of work their fathers do and to build up the foundry's importance in our daily life. We have had cooperation from some of the instructors in the schools.

Recently, Dominion Engineering started quite a comprehensive plan. I should like to ask Ewing Tait what he thinks of that plan.

Emphasize General Apprentice Training

G. EWING TAIT: Well, I think quite highly of it. However, we haven't as many apprentices as we would like. One of the main problems is to get interested boys with proper qualifications into the foundry. We haven't just taken three because we couldn't get more; we had a great many applications, but many boys were not suitable for foundry work, or for the positions for which we are trying to develop them.

I think Mr. Williams made an interesting point when he differentiated between apprentices and trainees. An apprentice is one learning the all-around practices of the foundry industry. A trainee is brought in for a specific job, and shown only how to do that job, which may take from less than six months up to a year.

During dinner Mr. Williams suggested that possibly we were giving too much attention to apprentice training, that there wouldn't be sufficient openings as supervisors or in highly skilled jobs for all apprentices trained. That may be a problem for the future, but I don't think it is a serious one today. I think, from the viewpoint of the foundry industry as a whole, that we

Discussing apprentice training at the first assembled Round Table sponsored by AMERICAN FOUNDRYMAN *are (left to right): Henry Louette, Warden King, Ltd., Montreal, Que.; Robert Hale, Canadian Car & Foundry Co. Ltd., Turcot, Que.; National Director E. N. Delahunt, Warden King, Ltd., Montreal, Que., presiding; Gerald L. White, Westman Publications, Ltd., Toronto, Ont.; R. H. Williams, Canadian Westinghouse Co., Ltd., Hamilton, Ont.; Russell A. Woods, George F. Pettinos, Ltd., Hamilton, Ont.; G. Ewing Tait, Dominion Engineering Works, Ltd., Montreal, Que.; and A. E. Cartwright, Crane Ltd., Montreal, Que.*

should be concentrating today on general apprentice training, primarily toward developing supervisors.

And I am not overlooking the fact that we also need skilled molders. You know that out of every ten boys you take into the plant you are not going to get ten supervisors. No matter how carefully they are picked, there are bound to be some who lack some of the characteristics required in supervisors, or who don't take in the training as fully as they should. These are the boys who will make skilled molders, always provided you can keep them in the industry.

We have arranged plant visits for boys in the last year of high school. They have been shown around the plant, given a couple of talks in the cafeteria and then they are asked if they have any questions. In three years, only one boy raised the question of how much money he was going to get. A few have raised it in

***E. N. Delahunt,** elected a National Director in 1947, is general superintendent of Warden King, Ltd., Montreal. Past chairman of the E. C. & N. Chapter, he has been affiliated with Crane Co. (Warden King is a Crane division) since 1920. He was born in Chester, Pa., and has a mechanical engineering degree from Catholic University, in Washington, D. C.*

private conversations. As far as we can see, if the boy is really interested in learning the trade and developing a career, money is not his first consideration.

First of all, I think the problem is to get the boys into the industry. If you don't get them into the foundry you can't train them. It is not a matter of getting any kind of boys. A suitable type must be physically able to do the work, have the required educational background to absorb what he is going to be taught and the personal characteristics that will make him a useful employee in the future, such as initiative, ambition and the ability to lead men.

You can't expect that to show very much in a boy, but if he is the right type that can be developed later. For educational qualifications we require at least tenth year, and preferably a High School Leaving Certificate, which is eleven years. We count technical school or trade school training. That is, a boy might have had only eight years elementary schooling but if he had two years of technical school we'd take him in.

The way we have gone about getting boys has been to have the apprentice training supervisor visit high schools, after consultation with the principals, and talk to tenth and eleventh year boys. Movies are shown on the foundry and machine shop operations. The supervisor explains what the training program consists of and hands out an attractive booklet explaining the course. The boys are invited to come and visit the plant with their parents on certain evenings. We make quite an effort to get the parents interested and certainly before we take a boy, the apprentice training supervisor will talk to the father. If the father can come down to the office and talk to him, fine; if he can't, the supervisor will visit him at home in the evening.

The main object is to get the father interested, so that he will back up the boy, and encourage him to take full advantage of the opportunities offered by the course. In one or two cases, where the boys were giving us a little bit of trouble during training, contact with the father was helpful in straightening matters out.

I might say, that, in addition to the foundry boys, we are also training 12 machinists and two pattern makers, and competition from other departments to a certain extent cuts down the number of boys who want to take foundry. As far as the Pattern Shop is concerned, we have trained two boys a year for about 25 years, and we are certainly seeing the results of the program,

***Henry Louette,** a member of the A.F.S. Apprentice Training Committee and long interested in foundry education and training problems, is plant superintendent of Warden King, Ltd., Montreal, Quebec. Born in Belgium, he moved to Canada where he studied at the Montreal Technical School, graduating in 1918. He started at Warden King in 1921.*

because most of the best pattern makers are boys we have trained in our own shop.

R. H. Williams: What is the total number of pattern makers in the shop?

G. Ewing Tait: Roughly 40. We have a waiting list for the Pattern Shop, and have had for a long time. Most of the pattern shop apprentices are sons of employees or of friends of employees. The Machine Shop is considered the next most attractive by the boys, and we have no trouble filling our quota there, but when it comes to the Foundry, it is a different matter.

We haven't solved the problem of how to attract all the boys we want or the right type of boy but we are making progress. It is a slow process of overcoming prejudices that exist against the foundry. I think we have as clean a foundry and as attractive working conditions as anybody in town or even in Canada, but it is still a foundry to the boys.

Personally, I feel that if we sell the boys on the idea that in the foundry they are doing more creative work, that their future work can be more interesting than in the machine shop which is largely routine, we will be a long way toward solving the problem. I don't think this can be done too well in general addresses to a class of boys. The main thing is to find the boys who show some interest and have them spend more time around the foundry than just the one visit, with somebody who knows the whole game explaining to them in considerable detail what is being done.

The foundry is the most interesting of the three

departments to anybody who knows the business, but it is difficult to inspire a boy who is just leaving high school with the necessary enthusiasm.

There is also a matter of persuading parents that "The Foundry is a *Good* Place to Work."

Our idea is to give the boys practical and theoretical training as we feel both are necessary to make all-around foundrymen out of them. We give all the training within the plant. In the case of smaller shops which haven't the facilities to give theoretical training, the logical thing is to fall back on the trade and technical schools.

We have a full-time apprentice training supervisor responsible for all apprentice training, and he has two assistants, one in the foundry and one in the machine shop. Even with this supervision the training program is a load on the rest of the staff, particularly giving the theoretical training because it takes much longer to prepare a lecture than to deliver it.

We have started out with a very ambitious program. When boys come into the foundry they are first shown the whole plant. Part of the first month is spent in the lecture room on blueprint reading with the Machine Shop boys. Then they spend five months in the Foundry School, which is a part of the foundry set aside for apprentices.

Apprentices Mold and Pour Small Castings

They start out making green sand molds for small castings, and just shaking them out but after two or three weeks they begin pouring metal into them. They don't necessarily make "exercise castings" although there are a certain number of jobs they make merely to learn how to perform particular operations and the castings are scrapped. The boys do a certain amount of productive work as well depending on what is available for them.

At the end of six months the group splits up and they move out into the various foundry departments to follow a definite schedule of so many weeks on each particular phase of the work. All the boys don't take the course in the same sequence. One boy may go into the Brass Foundry; another, the Core Room; another, the Heavy Dry Sand Floor, and so on, but in the course of a year, all cover the same ground.

In the first year, we train primarily on green sand molding and small core making. In the second year, the boys get heavier molding and a short period of loam work. In the third year, they spend time on loam

***G. Ewing Tait** is assistant manager of manufacturing in charge of metallurgical operations, Dominion Engineering Works, Ltd., Montreal, Que. A graduate of McGill University (B.S., Mechanical Engineering) he has been with his present company since 1930. Mr. Tait has served as chairman of the Eastern Canada and Newfoundland Chapter.*

***Russell A. Woods,** chairman (1948-49) of the Ontario Chapter, is sales manager for Geo. F. Pettinos (Canada), Ltd., Hamilton, Ontario. He joined his company and A.F.S. in 1940 and served as an Ontario Chapter director for three years and as vice-chairman for one year. Before joining Pettinos he was with Wood, Alexander & James, Ltd., for 15 years.*

work, heavy core making and large jolt-rollover machines. They also get into such departments as Sand Mixing, Cupola and Laboratory.

In the fourth year, they cover mostly heavy work and specialized work peculiar to our plant, as we make certain types of castings not encountered in regular foundry work. They also spend some time in the Foundry Office during the fourth year, both on cost and production work. In every year, they spend two weeks in the Pattern Shop and three weeks in the Machine Shop. Incidentally, the pattern maker and machinist apprentices spend a certain amount of time in the Foundry.

E. N. Delahunt. What do the foundry apprentices do in the Machine or Pattern Shop in those two weeks?

G. Ewing Tait: We don't try to train them to make patterns or finished parts. They do use the machines in the Machinist School and get some experience in small lathe work, drilling and milling. We give that to let them find out how the machines and tools work.

Observe Machining Operations

Most of the time they are just observing work in the various machine shop departments. A boy will spend a day watching boring mill operations, another day at the gear cutters, and so on. He just watches the tools work and doesn't actually help run them. The machine shop apprentice is expected to help run the tools.

The time is too short for the foundry apprentice to do any more than see how the machines work and how they are influenced by the work done in the foundry. We are trying to get them to look at the company business as a whole, not just at the Foundry or Machine Shop, as the case might be. We want the foundry boys to realize that if they do a good job, it makes it easier for the machinist.

In theoretical training, they start out with elementary foundry practice. We have been using National Foundry Association's *Short Term Training* for first year boys. This is a general though brief review of some of the points encountered in foundry work. From there on, we use International Correspondence School reference books supplementing them by lectures on elementary metallurgy, foundry materials and general subjects.

In the fourth year, the lectures deal mostly with our own particular work such as paper machine driers, hydraulic turbine head covers and other unusual or special jobs we manufacture. The object of these last

R. H. Williams was chemist and metallurgist for several companies in Canada and the United States from the time he graduated from McMaster University, 1936, until he became foundry superintendent, Canadian Westinghouse Co., Ltd., Hamilton, Ont. He served as director of the Ontario Chapter and is chairman of its active Educational Committee.

lectures is to tell the boys the background of our practice, why we use certain molding methods or gates and risers, service conditions on the castings, troubles encountered in the past, and so on.

We want to train the boys to think for themselves but first they must be well grounded. There are many molders and core makers who can carry on once they are given the necessary equipment and material. However there are too many who do not understand why they are told to follow a certain practice and unfortunately there are too many supervisors who issue instructions without explaining their object.

We realize that all these boys are not going to qualify as supervisors, but feel the style of training will be worth while, both to the boy and the company, over a period of years.

E. N. Delahunt: Two definite plans have been outlined here. Russ Woods gets around more than most of us do and I'd like to know how he feels these schemes apply in the average foundry.

Russell A. Woods: You have been talking about the larger shops where you have foundries and machine shops, and many different departments. I'd like to mention an instance of a small Ontario foundry pouring about 20 tons a day, faced with the problem of getting new supervision.

Small Foundry Trains Supervisor

They chose a smart fellow from their own organization, and knowing that he couldn't gain a wide variety of experience in their plant, they arranged to send him around at company expense to work for a few months in each of several foundries in Ontario.

The management of his company had set up a schedule with the plants to which they sent him. For instance, I found him charging a cupola in one foundry. In another foundry he was working in the laboratory testing sand. Over a period of a year-and-a-half he was in five or six different foundries for a few months at a time. Now he is back in his own plant, and has taken over the supervision.

E. N. Delahunt: It is rather easy for the larger organizations to outline definite schemes of training young lads, but the small foundry melting 10 to 20 tons a day doesn't have facilities that would permit following any of our more elaborate schemes. Our American Foundrymen's Society probably should encourage foundries to work together on a scheme similar to that just outlined for well-rounded training.

Let's get a few ideas now from you, Bob Hale, on what they do in steel foundries.

Robert Hale: Our foundry is partially mechanized, and we do a lot of jobbing work too. What we have heard tonight on both sides of the question is particularly true as far as we are concerned in regard to getting a suitable type of boy to follow the trade as an apprentice. At the moment, we have only two apprentices in our foundries. We have a lot of trainees, the same as many others have. There is a very real difference between the two.

An apprentice is a young fellow to whom you can give a thorough knowledge of foundry work. A trainee, as a rule, is several years older than an apprentice should be, and in many instances is a married man before he starts his training.

The trainee may achieve skill in one or two lines. I wouldn't say he is too old to absorb knowledge expected of an all-around foundryman, but the trainee who is married and older frequently feels he can't

Robert Hale, superintendent of the steel foundry division, Canadian Car & Foundry Co., Ltd., Turcot, Que., started as an apprentice with his company in 1912 when the organization was known as Canadian Steel Foundries. His apprenticeship was interrupted while he served in the Canadian Army. He was born in London, England.

afford to go down to a lower rate to get greater knowledge. He is more inclined to stay in production work where he can earn more money even though he has less future.

Generally speaking, we find that getting young fellows into the foundry is a big problem. Nevertheless, we have to get them because, in a few years the shortage of skilled men will be even more severe unless young men are trained today.

All apprentices cannot become supervisors but they can become skilled mechanics and that is what the foundry industry needs at this time and will need five or ten years from now. Evidently our duty is to sell the foundry to young fellows, so that we can put skill into their minds and hands. Such training has been brought out pretty well tonight.

In addition to the departments named by Mr. Tait, it might be a good thing if apprentices helped one of the foundrymen in the laying out of work, to give them an idea of what supervision work is, beyond the supervision of the mold.

A good apprentice should be a man of good character, ambitious, intelligent, and have some high school education, and should be prepared to take further instruction at night school. The shop training should be thorough and foremen would do well to have apprentices spend some time in assisting them in their

work. The time needed for apprenticeship is not less than five years, and under no consideration should an apprentice be a piece worker for any length of time.

G. Ewing Tait: The training we are giving at the moment is practically straight apprentice training. We plan to give the best boys a special period of supervisory training but it won't be until a couple of years after they have finished their apprentice training. We may lose the boys after we have trained them because there is quite a demand for trained men, both supervisors, and molders and core makers. Others may offer more than we are able to pay or more rapid advancement than we might have to offer at any given time.

Give Broad Experience

To counteract this, we have tentatively adopted a policy that a boy won't work more than one year in any one department after completion of training. The object is to keep up interest as well as to develop the broadest possible experience.

The object of putting the apprentices into the office, is just so they will see what is behind the scenes, what the time keeper, the production control man and others have to do. We issue target times, that is times in which we expect jobs to be done. They are summarized weekly and the departments show losses or gains, depending on how well they meet the times. In putting the boys into the cost section of the office, they see how the target times are made up and learn to have some confidence in them.

R. H. Williams: I should like to pick up your point about losing apprentices to somebody who might offer them a better job. Don't you think we should take the view that we are making a contribution to the industry? Suppose you do lose two or three that were trained in your shop. You should not feel too badly to see them go out of your shop because some day in some way they may be doing business with your company. They will know what you have to offer, what facilities you have, and probably make use of the training they got there in furthering their own and your interests.

After a few years of outside experience, they may return. And you will get men trained by others, too. We should all be training apprentices even though we are training only a few.

Make Plant Opportunities Attractive

G. Ewing Tait: We are not allowing the fear of losing our boys to interfere with our training policy but we know that if we don't make an effort to retain the boys they will want to move, as there will be some competition for them. Our policy is to make the plant so attractive that we won't lose them. A couple of years ago the Eastern Canada and Newfoundland Chapter made a survey of all Montreal foundries, and found practically none interested in genuine apprentice training. Their main comment was on training boys who might not stay with them. That attitude is wrong because if none of us trains boys there will soon be no molders or core makers.

Henry Louette: To interest boys in the foundry we have had plant visits for boys from Three Rivers, Shawinigan and Montreal. During the visits we have tried to bring out the advantages and the creative interests the foundry has. About three years ago one boy of the Shawinigan group got a job across the road. When he heard we had an opening for a mechanical draftsman, he came over to our place.

Later he said, "When you fellows told us about the foundry, we said as we left, 'We hope never to work in there'." That was the general reaction of all technical graduates. Now this chap has been working for us about two years and he would never leave our plant, he likes the foundry so well.

I feel a boy has to get into foundry work in some indirect way, and without forcing; if he likes it he will fall in line. In our plant we have 16 young fellows taking evening classes in school; their ages are from about 17 to 19. They have been working with us about one-and-a-half or two years and realize "The Foundry is a *Good* Place to Work."

Robert Hale: Do they see more possibility of promotion in the foundry than in the office?

Henry Louette: Yes, and an advantage of bringing the boys in from the office is that they then have a knowledge of the usual complaints from the shop and they will therefore be more understanding employees.

What Is Training Objective?

G. L. White: It seems to me that one of the problems you encounter in apprentice training is that certain foundries still look upon it only as a means of obtaining skilled molders. From what has been said here tonight, the foundries represented look upon it mainly as a method of developing supervisory people. Some may revert into the trade of skilled molders.

We must realize that it is going to be difficult to get young men to put in the length of training required to achieve the skill some of the old molders have, unless they can see opportunities greater than those offered on the molding floor.

I know of a good jobbing foundry in Ontario where they are facing that problem today by trying to develop good supervisory men, and transferring most of the skill to this supervisory group. There was time when they could hand a pattern to a man in the shop and let him go on from there. Now someone in the Planning Department has to lay out every detail of the job and give it to a reasonably skilled man who has had a fair amount of practice to do the actual molding.

Robert Hale: That is more or less getting back to taking skilled workers to be supervisors over trainees. Our need is to get young men into the foundry and train them to become skilled molders or core makers.

Gerald L. White *is advertising manager of Westman Publications, Ltd., Toronto, and editor of* Canadian Metals & Metallurgical Industries. *He has been with Westman Publications since 1933 when he graduated from the University of Toronto with a science degree. He has served the Ontario Chapter as secretary-treasurer since the early 1940's.*

A. E. CARTWRIGHT: I think that a lot of gaps exist between different peoples' conceptions of apprentice training, and lack of unanimity is reflected in haphazard training methods.

It seems doubtful that the right type of propaganda is being aimed at the general public. The conducted visits of high school students through the various foundries has, in the absence of a convincing description of a well-organized apprentice training scheme, failed to intrigue the boys or show teachers and parents that "The Foundry is a *Good* Place to Work."

I have always felt sorry that the word 'good' was selected for the slogan; the variety of connotations of the word together with the superficial impressions obtainable from a conducted tour are apt to leave the impression that the slogan is a gross misstatement or, at least, somewhat of an evasion.

A. E. Cartwright, *chairman of the Eastern Canada & Newfoundland Chapter, 1947-48, is metallurgist of Crane Ltd., Montreal. Author of A. F. S. Convention papers and frequent speaker before A. F. S. and other technical groups, he was born in Shropshire, England, where he received his technical educction, chemical and metallurgical training.*

For example, if 'good' is taken to mean 'pleasant' by the visitor, he may emphatically disagree. If he selects 'profitable' as an interpretation of the word, he will usually require a convincing argument as he observes the sketchy training systems in vogue in many foundries. Yet the foundry industry can, with due care and consideration, make every "foundry an interesting and profitable place in which to work."

There is, I feel, some confusion as to the end product aimed at in different apprentice training schemes. In view of the ever increasing amount of mechanization in foundry practice requiring mainly semiskilled but intelligent men, the foundryman is apt to be somewhat hesitant to make definite promises of rapid advancement on completion of their training to prospective apprentices. A hesitant or non-committal attitude in holding out a reasonably attractive goal is, I believe a deterrant to a young man selecting a life-time career.

Actually, there is such a variety of mental capacity and significant characteristics available among prospective apprentices that uncertainty on the part of the foundryman in assessing ultimate values can be largely eliminated by a sufficiently flexible training scheme. He should be able to provide alternatives within a training course of varying length, intensity and scope, each of them having attractive features.

A probationary period of standard training followed by direction into one of two or three diverging programs is essential to this method. This idea has been well brought out this evening by Mr. Louette in his discussion and also was referred to by Messrs. Brah and Bowers in their separate contributions published in AMERICAN FOUNDRYMAN of August, 1948 ("How Long Does It Take to Train an Apprentice?" page 25.)

The loss of trained men by the company that has borne the expense of training can be serious but would be rendered much less so were equally well-trained men from other shops available.

Much value could come from more cooperation and less self-sufficiency in the training of foundry apprentices. For example, the problem of preparation and delivery of technical lectures would become lighter were the various subjects apportioned between the staffs of several organizations operating training schemes in the district and worked out on a cooperative time schedule for delivery at their various plants.

It would seem that A.F.S. chapters could render a worthwhile service by acting as a medium for focussing on discussion and deliberation to foster mutual assistance in training methods among member companies.

If such cooperation existed within large foundry centers, there would be much less room for the apprehension expressed by Mr. Tait of losing trained employees since a healthy interchange would generally be substituted.

In my early days in England many large engineering firms regularly trained apprentices to the best of their ability. At the end of an apprentice's training he was told to go out and get a job and hold it for at least a year before returning to apply for work as a competent mechanic. This procedure was such an accepted rule that no one ever questioned it and many, to my knowledge, did return with added experience and confidence to well paid jobs in their 'Alma Mater.'

Whatever the merits of such a policy of casting bread upon the waters, it certainly indicated confidence of the company which trained the individual in their training methods as well as their confidence in the training methods of other firms engaged in similar engineering activities.

E. N. DELAHUNT: I believe that we have benefited from tonight's discussion.

The American Foundrymen's Society has done a great deal to advertise and promote the foundry industry. We are on a much better footing with the public than ever before. People are beginning to realize that our industry is most basic, that there is nothing in our everyday life that does not depend on castings in some way. As that feeling grows, we will get more lads interested, but we are not going to do it overnight.

Reprint Fast-Selling Cupola Book

SECOND PRINTING of the popular HANDBOOK OF CUPOLA OPERATION has been completed and books are available immediately. On view at the Publications Booth during the 53rd Annual A.F.S. Convention in St. Louis, the volume is selling rapidly. Member price is $6.00; non-member price is $10.00. Most extensive publication on cupola operations available, the 468-page HANDBOOK OF CUPOLA OPERATION was prepared by 128 leading foundry metallurgists, practical foundrymen and cupola operators. In addition to an extensive bibliography the book contains 188 graphs and illustrations and 34 tables.

PRODUCTS PARADE . . .

"AN EXHIBIT ON PAPER"

American Foundryman herewith presents the second of three articles designed to provide a showcase for the display of the newest developments in foundry equipment, materials and services at Convention time in a year when the biennial A.F.S. Foundry Congress and Exhibit is not held. On the pages of this "Exhibit on Paper" will be found the outstanding tools of the foundry craft that have been developed recently by the nation's equipment and materials manufacturers. More detailed information on the products described here can be obtained by filling in the convenient coupon on Page 98. Section One of "Products Parade" appeared on Pages 103-114 (coupon on Page 114) of the April issue of American Foundryman, and as a result of an overwhelming response, a third and concluding section will appear in the June, 1949, issue of "The Foundrymen's *Own* Magazine."

55. Bonded Disc Wheel

A bonded disc wheel for rotary sanders that is said to last longer than a coated abrasive sanding disc and to be more easily handled than a flaring cup wheel is announced by Raybestos-Manhattan, Inc.'s Manhattan Rubber Division. These discs have fast free cutting qualities necessary in fabricating alloys that must be ground and finished without excessive heat. Flexibility and resiliency of Moldisc result in superior product finish. Other advantages: longer life, uniform cutting action, increased production, lower grinding costs, greater ease of handling and safety. Supplied in standard 7 in. diameter, ¼ in. thickness and ⅞ in. hole.

56. Refractory Cement

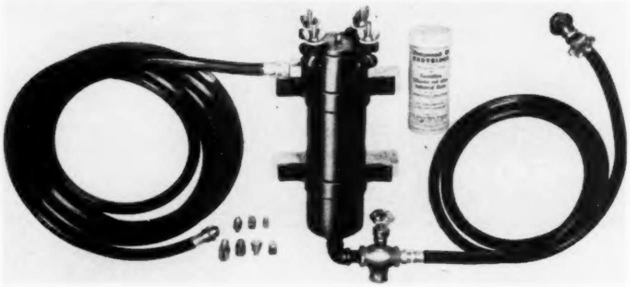
An air setting, refractory cement, C199, announced by the Armstrong Cork Co., is designed for use with all types of clay and insulating firebrick and is recommended as a protective facing for firebrick or insulating firebrick furnace linings. Easily thinned, readily poured and highly plastic, C199 is thoroughly mixed and shipped in 16, 50, 95 and 185 lb steel drums for immediate use.

57. Testing Sieves

Testing sieves, ranging from 3 in. opening to No. 325 mesh, 8 in. diameter, 2 in. or 1 in. deep, developed by the Humboldt Mfg. Co., meet all U. S. Bureau of Standards specifications. Also available are Humboldt sieve shakers.

58. Duplex Melting Furnace

An electric furnace that acts as a heated mixing ladle, combining the functions of both cupola and electric furnace in a process known as duplexing—molten iron from cupola to electric furnace—is available through the Whiting Corp. All the advantages of continuous pouring are provided by duplex melting, which assures proper pouring temperatures. The Hydro-Arc furnace also provides a convenient place for alloying or adjusting composition.



59. Wetting Agent

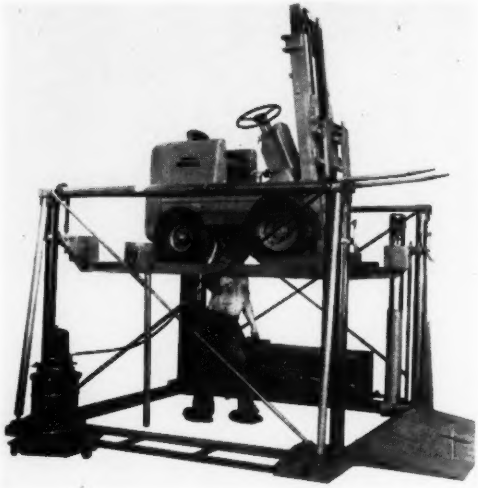
An active wetting compound for reducing the surface tension of ordinary water and increasing the wettability of sand and dust has been developed by the Johnson-March Corp. Compound M, either in liquid or solid form, is proportioned with water to form a solution which is applied through nozzles to bring about uniform distribution of moisture throughout foundry sand. Compound M can also be used to allay dust in foundry applications where water will not.

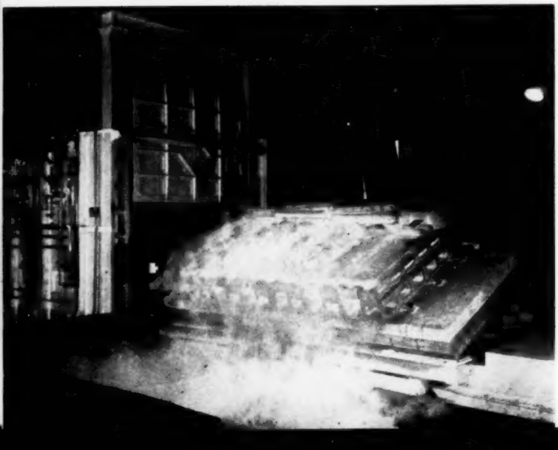
60. Industrial Gloves

Manufactured to meet the specific requirements of foundry work, heat and flame resistant gloves developed by the C. Walker Jones Co. will fit either hand and may be washed and used repeatedly without heat resistance loss.

61. Fork Truck Lifter

An electric hydraulic lifter that services all makes of fork lift trucks, industrial trailers and platform trucks is announced by Service Caster & Truck Corp. Built in 6,000 and 12,000 lb capacities, the maintenance lifter's open platform elevates trucks to proper height for lubrication, inspection and servicing. Features: support block for truck counterweights, a method of chocking truck wheels, safety hooks and pipes, and dead-man controls.





62. Bottom Furnace With Side Dump

George J. Hagan Co.'s car bottom furnace with side dump for quenching has a rated capacity of five tons and is used for automatically heat treating austenitic manganese (14 per cent manganese) castings. Equipped with self-contained hydraulic system for dump, and motor-operated rack and pinion car drive. Complete cycle—furnace to quench—takes only one minute, reducing chances of carbon precipitation. The Hagan furnace will handle castings up to 2,000 lb with temperature range up to 2,000 F.

63. Vibrators

Cleveland Vibrator Co.'s new Series SA pneumatically-operated vibrators are recommended for such applications as removing match-plate patterns from sand molds, assuring steady flow from hoppers, vibrating tables used in packaging, fatigue testing assemblies, and moving granular materials through chutes, etc. Seven sizes are available, with five mounting arrangements as shown in accompanying illustration. Units range in overall dimensions from $5\frac{3}{8} \times \frac{7}{8} \times 1\frac{1}{2}$ in. to $8 \times 1\frac{3}{4} \times 2\frac{1}{4}$ in. Air consumption ranges from 5 to $8\frac{1}{2}$ cfm on 80 psi line pressure. Operational speeds range from 5,100 vibrations per minute on the smallest size to 1,950 vpm on largest.

64. Optical Pyrometer

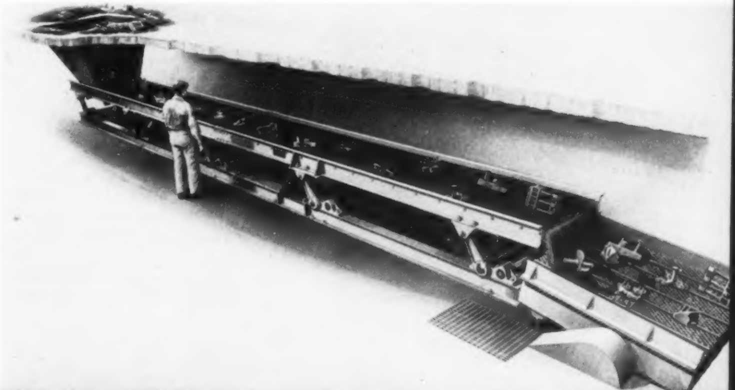
Designed for taking temperature readings of molten ferrous metals, Pyrometer Instrument Co.'s new-model open hearth optical pyrometer has had its reading scale lengthened 40 per cent and covers only critical portion of range required. Self-contained, direct-reading and lightweight, the instrument allows rapid reading of fast-moving objects, small streams, etc., without use of correction charts by means of two dial scales.

65. Cut-Off Machine

A vertical cut-off machine with a capacity of 18 x 18 in., developed by Grob Brothers, cuts out sections from plates, permits closer adjustment of saw guides and ease of feeding. Other features: automatic cutting cycle, electrically controlled work feed pressure with adjustable hydraulic check control.

66. Oscillating Trough Conveyor

A positive action, roller bearing, eccentric-type oscillating trough feeder conveyor developed by the Link-Belt Co., is suitable for handling a wide variety of materials economically on a horizontal path. Available in trough widths of 12 to 48 in., and in single trough lengths up to 100 ft, the PA oscillator can also serve as a cooler, dryer or conditioning unit, and can be fabricated of corrosion and heat resistant metals.

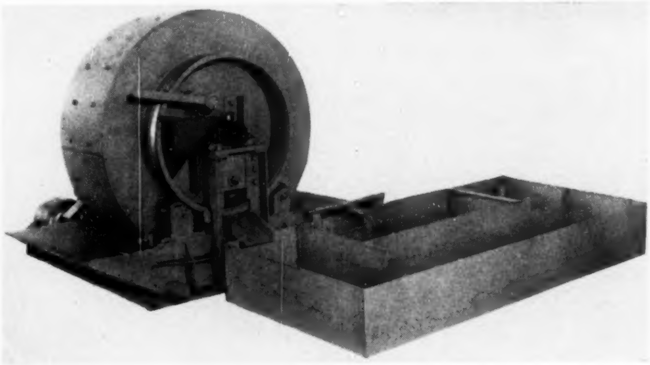


67. Gasoline-Powered Industrial Truck

A new line of gasoline-powered industrial lift trucks, announced by Yale & Towne Mfg. Co., features fluid drive, automotive controls, two-stage hydraulic piston lift, low mast heights and high free lifts. Series 1 trucks have 66-in. free lift, overall collapsed height of 83 in., 6,000 lb carrying capacity, with 130 in. reach from floor. Series 2 trucks have an overall collapsed height of 68 in., a free lift of 51 in. and a total reach of 100 in. Other features: full vision, shockless steering, hydraulic brakes, cushion tires.

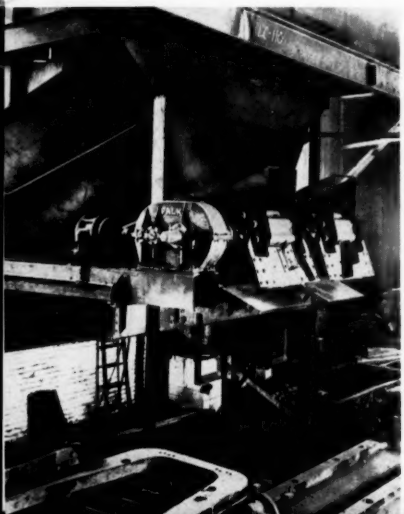
68. Metal Reclaiming Mill

Made in four sizes, for small and large production, Dreisbach Engineering Corp.'s metal reclaiming mill recovers all metallic particles from cinders, slag, skimmings, old firebrick, crucibles and sweepings at lowest cost and will return clean metal, free from oxides and suitable for remelting. Reclamation within the foundry itself with the Dreisbach mill eliminates freight and handling cost. Available in four standard sizes, ranging from 2½ in. maximum feed size, 400-1,000 lb per hr feed rate, to 4 in. maximum feed size, 3,000-8,000 lb per hr feed rate, with automatic sludge ejector.



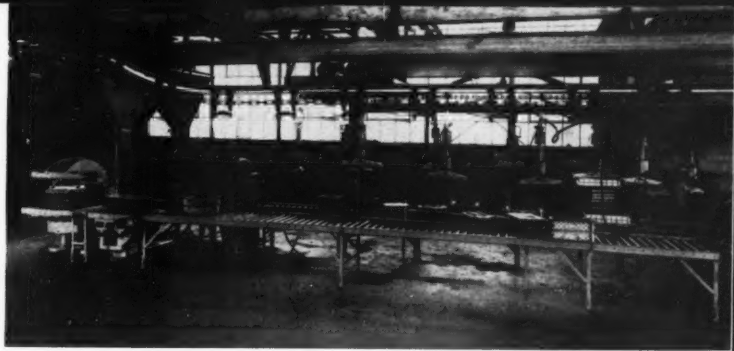
69. Core Oil

Ten important characteristics of Penola, Inc.'s Penolyn core oil that contribute to the production of high-quality cores are: (1) Uniformity—no settling out in drums or tanks; (2) Concentrated Form—high sand to oil ratio; (3) No Obnoxious Odor—during mixing, baking or pouring; (4) No Seepage—will not settle or drain to bottom of sand mix; (5) No Crusting or Green Mix—air dries slowly, green mix can be stored as long as 24 hours before use; (6) Clean Working—eliminates frequent core box cleaning, sharp draws; (7) Wide Temperature Baking Range—small and large cores bake simultaneously, no burnt cores; (8) Polymerized Formulation—insures maximum strength; (9) Minimum Gas; (10) Ample Collapsibility—fewer cracked castings.



70. Conveyor Drive Backstop

A positive method of preventing reverse rotation on conveyor drives, winches, windlasses, etc., is provided by Falk Corp.'s backstop, which utilizes gravity to wedge cylindrically machined pawls against housing bore to stop reverse motion. Built in three sizes to accommodate a wide range of shaft diameters and torque requirements, the sturdily-constructed Falk backstop reduces shock and strain to a minimum.



71. Match Plate Molding Unit

Seven inexperienced men can be quickly trained to make molds from matchplates through use of the Fellows Corp.'s progressive matchplate molding unit. Ten patterns are handled by the seven men over four machines with two sand hoppers —instead of ten men, ten machines and ten hoppers. By mechanically performing the rollover operation and handling of copes, large work is made at the same rate as small work and larger patterns can be run. The cope-handling conveyor is the mechanical pace-setter for rate of production.

72. Colloidal Graphite

Acheson Colloid Co.'s colloidal graphite—for general lubrication, high or low temperature lubrication, parting, impregnation and opaquing—has 19 versatile properties and applications: (1) unctuous dry lubricating solid; (2) conducts electricity; (3) high-temperature resistant; (4) anticorrosive agent; (5) co-dispersible with many liquids and solids; (6) has truly colloidal dimensions; (7) chemically inert; (8) practically pure; (9) opaque; (10) conducts heat; (11) resistance compound; (12) low photoelectric sensitivity; (13) low coefficient of expansion; (14) gas absorbent; (15) has "black body"; (16) diamagnetic; (17) specific gravity between 2.0 and 2.25; (18) Moh's scale of hardness less than 1; and (19) has electrically charged particles.

73. Dust Collecting Unit

Parsons Engineering Corp.'s line of small, portable, self-contained dust collectors, with air capacities ranging from 550 to 1,350 cfm, are available in four sizes and filter and collect practically all types of industrial dust. Units are set close to dust source by attaching hose to collector inlet where no central system is available.

75. Air and Hydraulic Cylinders

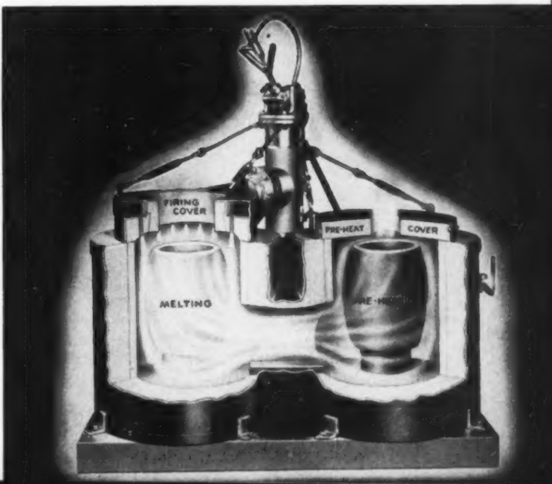
A complete line of standard and special air and hydraulic cylinders is announced by Hydro-Line Mfg. Co. Air cylinder standards range from $1\frac{1}{2}$ to 14 in. bore, with cushions optional. Barrels of brass tubing. No tie rods. Gasket seal. Preset, self-adjusting chevron eliminates take-up. Hydraulic cylinder standards range from $1\frac{1}{2}$ to 8 in. bore. Cast iron, centrifugally-cast, machined and honed cylinder body. Cast iron piston fitted with auto-type piston rings. O-rings seal connections. Removable assembly. Special units to order.

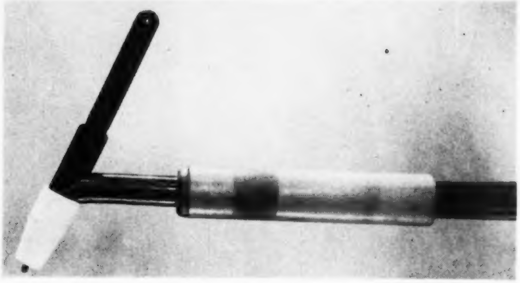
76. Rotary and Centrifugal Blowers

A complete line of rotary positive blowers and centrifugal blowers for the cupola, developed in almost a century of blower manufacture by the Root-Connersville Blower Corp., are engineered to the job. A large staff of R-C engineers is available to foundrymen for consultation on installation problems, design and construction, and types of blowers for specific cupola installations.

74. Twin Crucible Furnace

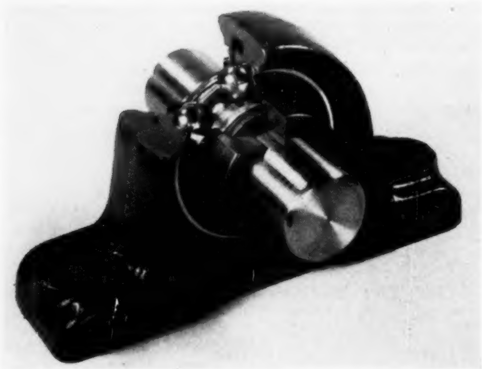
Randall Foundry Equipment Corp.'s twin crucible furnace operates on the principles of down-firing through a multiple of small burners in one cover, with heat directed through a tunnel to second crucible, preheating second charge. When metal in melting chamber is ready to pour, covers are transposed, reversing the melting cycle. Advantages claimed by manufacturer are: fuel savings using waste heat to preheat next melt; no cold spots; less oxidation of metal; no swirling; longer liner and crucible life; more heats per hour; and one-man operation.





77. Water-Cooled Welding Torch

Designed for inert gas-shielded arc welding, Linde Air Products Co.'s new water-cooled torch has a lightweight, flexible power cable, a gas cup of non-conducting material, and adjustable tungsten electrode. Process shields weld area from oxidizing atmosphere under inert gas blanket and overcomes difficulty of welding corrosion-resistant metals.



78. Pillow Block

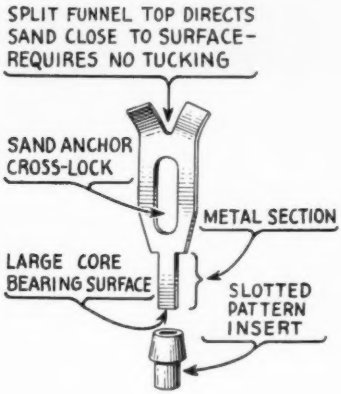
A new series of pillow blocks developed by the Fafnir Bearing Co. is available in nine shaft sizes, from $1\frac{3}{16}$ to $2\frac{15}{16}$ in. The LAO Series blocks incorporate heavy series ball bearings with self-locking collars. A pressed seal and felt closure keeps out dirt and moisture. External seal rotates with inner ring. Housing is single piece.

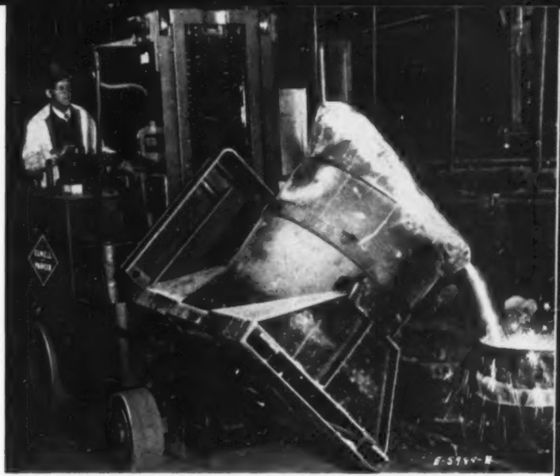
79. Sand Blast Helmet

New materials and improved design are features of E. D. Bullard Co.'s lightweight sand blast helmet. Outer hood is neoprene rubber covered fiber glass. All-rubber exterior, rubber lens frame, self-adjusting elastic neckpiece, readily-removed inner cape are other features. Equipment includes laminated lens, cover glass, and screen facepiece.

80. Truck Frame Molding Drag Conveyor

Illustrated is truck frame molding drag conveyor developed by the Standard Conveyor Co. One of several types of roller conveyor lines for specific foundry usage, this model is equipped with grease-sealed bearings to provide a maximum of protection and durability. Bearings reduce vibration and are protected against entry of grit, sand, dust, etc., to vital working parts. In addition to unit pictured here, Standard's line includes roller conveyors for mold assembly lines, transfer units, and storage lines for foundry flasks. Auxiliary systems carry castings to cleaning rooms and storage rooms.





81. Chaplets and Pattern Inserts

A new style shoulder chaplet and pattern insert developed by the Ideal Chaplet Works, is especially designed for light and medium section castings, such as manifolds and pressure-tight pumps. Chaplet's funnel-shaped top permits sand to lodge close to stem and pattern. Top also acts as backstop to keep core from moving during pouring. Chaplets can be supplied in tin plate or any desired metal.

82. Fork Truck Pouring Attachment

An improved device whereby metal can be poured directly from ladles by means of an electric industrial truck is a feature of Elwell-Parker Electric Co.'s new line of fork trucks and equipment. Ladle is mounted on standard fork truck with rotating head. Driver controls all truck movements and speed gradations in operating rotating mechanism and ladle. Unit illustrated has 4,000 lb capacity.

83. Aluminum Flask

C. S. Humphrey Co.'s line of aluminum flasks are interchangeable on sides and ends for assembly into a variety of flask sizes, are lightweight, non-corrosive and can be knocked down for storage and transport. Available in standard size from 12 x 12 to 36 x 36 in., 3, 4, 6, 7 in. high.

84. Gas-Fired Furnaces

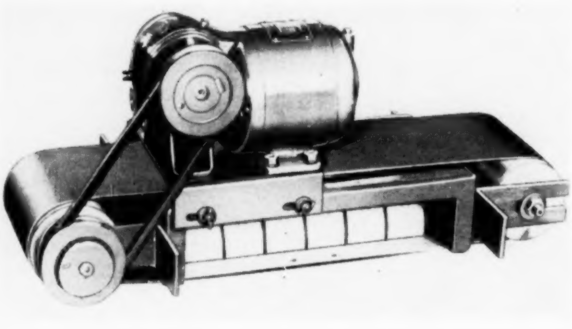
Surface Combustion Corp.'s full line of gas-fired furnaces for metal melting, remelting, oven furnaces, pot furnaces, atmosphere furnaces, convection and industrial furnaces is "standard rated"—rated to perform at a specified capacity to meet production needs—at so many pounds heated per hour to required temperature at a predetermined gas consumption rate. Furnace designs are standardized for economy, ease of maintenance and parts replacement, and rapid production. Temperature range, size, construction and performance can be modified for special requirements.

85. Sand Conditioner

Self-propelled and self-loading, the Royer Foundry & Machine Co.'s new unit automatically performs all sand preparation operations by moving directly to sand heap, scooping up sand, moving it to combing belt and discharging it at a rate of up to 50 tons per hour. Compact (7 ft 3 in. high x 5 ft 4 in. wide x 7 ft 3 in. long, weight 5,100 lb), the unit's three motors use a total of only 11 hp. One man controls all operations—moving forward or backward, loading, trash removal and complete sand conditioning—with a minimum of physical labor.

86. Electrostatic Sampler

A modern precision instrument for sampling air contaminated by dust and fumes of molten metal and smoke, Mine Safety Appliances Co.'s electrostatic sampler enables operator to quickly and accurately determine the location of plant health hazards. Portable and lightweight, unit operates from 110 volt, a-c current.



87. Magnetic Separator

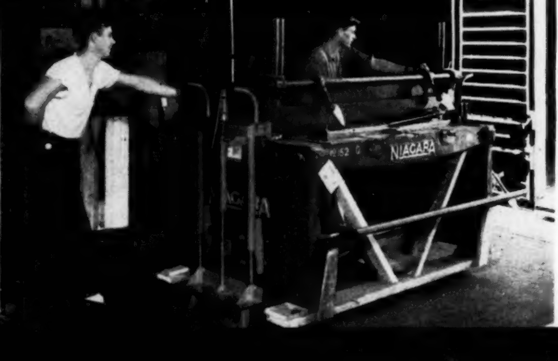
Dings Magnetic Separator Co.'s permanent, non-electric magnet unit is designed to provide moderately-priced automatic protection for machinery susceptible to tramp iron damage and to remove iron contaminants from foundry sand. Unit consists of a heavy duty plate magnet and a motor-driven, endless cross belt. Magnet attracts and holds tramp iron to underside of belt, which carries it to side out of influence of magnet and drops it. Available in a range of sizes.

88. Sand Riddling Machine

A sand riddler developed by Roller Riddle Corp. eliminates manual performance of this task and: (1) riddles enough sand to cover an ordinary pattern plate in 12 x 18 flask in 3 seconds; (2) can be raised or lowered to fit any type flask; (3) starts and stops automatically; (4) eliminates sand waste; (5) will not pile up sand anywhere except in center of basket; (6) uses screen of any size mesh; (7) oscillates 900 times per minute; and (8) requires no bearing lubrication.

89. Carbon Bonded Crucible

Joseph Dixon Crucible Co.'s carbon-bonded crucibles are constructed to meet rapid thermal shock, heat rapidly due to high conductivity, and are protected against oxidation by an always-active deoxidizing material.



90. Lift Truck

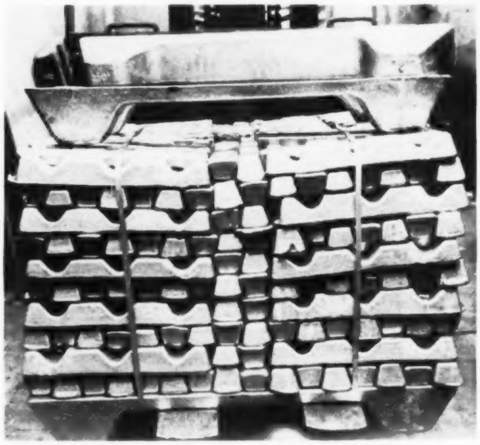
Designed to handle loads too heavy or bulky for fork trucks, Skarnes Engineering and Supply Co.'s new lift trucks are available in two models, M-2, with 2,000 lb capacity, and M-8, with 8,000 lb capacity. Both models have adjustable forks and are moved about like hand trucks. Fork inserted underneath load, then unit is jacked up, lifting load and putting it on wheels. After load is moved into place, it is lowered to floor at controlled speed. Both models have full swiveling casters for maneuverability.

91. Finishing Tools

Illustrated is Model 6680-G right angle grinder, one of the Rotor Tool Co.'s 360-cycle line of cone sanders, small wheel grinders, cone grinders, die grinders, grinders, buffers, wire-brushing machines, right angle grinders, sanders and polishers. Weights range from 5 lb for the 21,600 rpm die grinder to 14 lb for heavy duty buffer.

92. Exothermic Materials

Exothermic metallurgical products for the foundry developed by Exomet, Inc., include Risotherm, for elimination of piping-type shrinkage in risers; Ladletherm, for alloying metal in the ladle; Exocast, for producing metal for castings without use of melting equipment; and Exoweld, for joining heavy sections of any desired analysis.



93. Packaged Ingots

American Metal Co., Ltd., has developed an efficient method of bundling 5 and 30 lb ingots. Weighing approximately 2,000 lb, these bundles are strapped to a pallet cast from the same heat of metal as the body of the metal. The bundle, as illustrated at left, can be handled readily by a fork truck, facilitating loading and unloading of trucks or cars, and permitting easier stacking for storage.

94. Mexican Amorphous Graphite

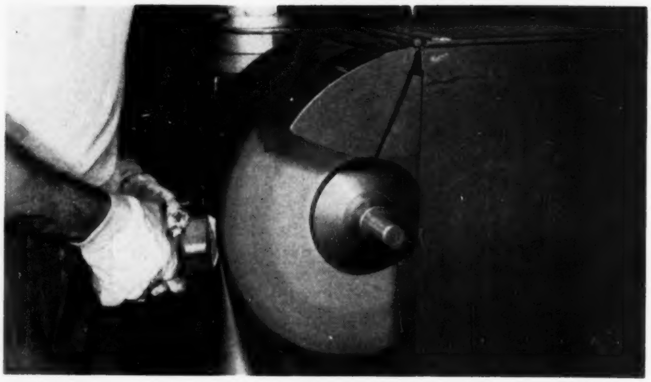
Mined in the state of Sonora, Mexico, by the Sonora Graphite Co., a subsidiary of the Cummings-Moore Graphite Co., Mexican amorphous graphite has been used in the iron and steel industries for 25 years as recarburizer in open hearths, cupolas, and ladles and as a foundry facing.

95. Flask Guides

Assuring absolute alignment of cope and drag through a unique, patented design, Buckeye Products Co.'s "3-in-1" flask guides feature four new major improvements, including a three-point locking arrangement of slide and pin, a wider and stronger ear, and a slotted matchplate lug. The locking arrangement has two locking screws, which hold the slide more firmly against the pin. The added width of the ear gives the molder a better grip when lifting or turning the flask and enables it to withstand jolting and squeezing operations without cracking or straining. Slotted matchplate lug permits easier, faster attachment to matchplate and correct adjustment to pin. In 3, 4, 5, 6, 7, 8 in. lengths for straight or tapered flasks.

96. Band Sawing Machine

A large new low-cost, high speed, high production foundry band saw for fast removal of gates and risers has been developed by the Do-ALL Co. Model 36-L is furnished with optional drive, direct or belted, equipped with stepless variable blade speed control over a selected range of either 1,000 to 5,000 or 2,000 to 10,000 fpm. Drive motors from 3 to 10 hp may be used to suit type of work. Maximum space between guide and table is 20 in. Construction is of all-welded steel. Both carrier wheels have aircraft-type hydraulic brakes.

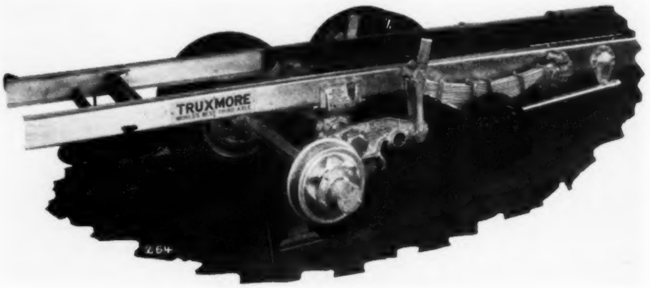


97. Contact Wheel

Claimed to be the first designed for heavy grinding with abrasive belts at speeds of 10,000 surface fpm, Minnesota Mining & Mfg. Co.'s new contact wheel has such major advantages as faster and cooler stock removal, lower production costs, and chatter-free grinding. The K wheel is made in 8 and 16 in. diameters in face widths of 2, 3, 4, and 6 in. and is designed for use with cloth belts coated with silicon carbide or aluminum oxide mineral grains.

98. Eye Sweep

General Scientific Co.'s eye sweep is fitted with a magnet at one end for removing steel splinters from the eye, and at the other end has a flexible loop for removing cinders, dust and foreign particles.

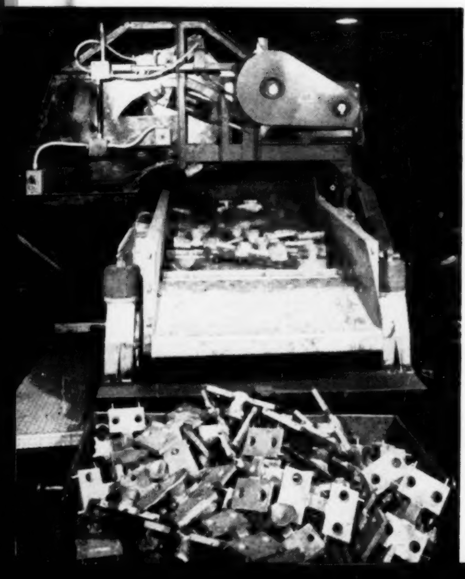


99. Truck Axle

Truck Equipment Co.'s "Third Axle" provides a means of carrying more payload per pound of truck and increases truck GVW rating up to 100 per cent. Installed under the rear of truck chassis, the axle makes a six-wheeler out of a four-wheeler truck, enabling it to carry much heavier loads with greater ride smoothness and greater safety.

100. Portable Mold Dryer

Designed to speed up drying of molds, the Mahr portable mold dryer is equipped with low pressure oil burner and high-volume circulating fan. Hot air is driven into mold, causing it to dry from inside out, making it necessary to dry to depth of only 2 or 3 in. for easier shakeout. Unit can be fired either with gas or oil, is available in four sizes—from 250,000 btu to 1,250,000 btu capacity.

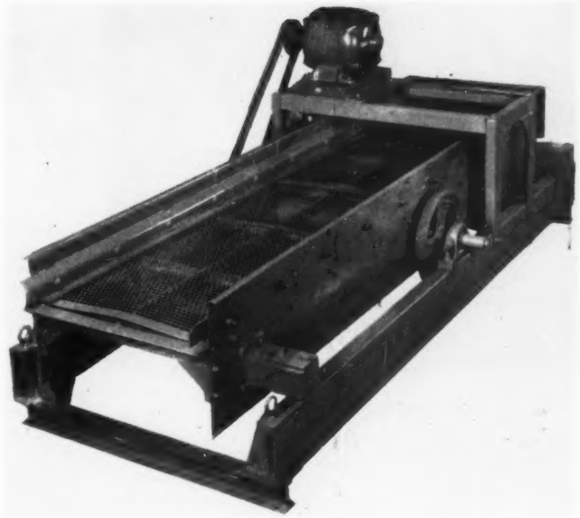


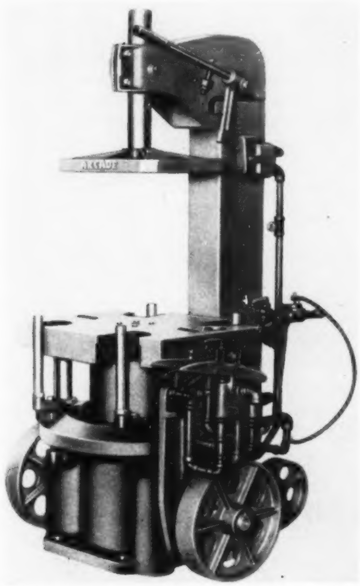
101. Portable Shakeout

Productive Equipment Corp.'s portable shakeout is designed for operating on rails where sand handling equipment is not available. In operation, squeezer flasks are tipped off conveyor into skip hoist which discharges sand and castings and returns automatically to position. Castings are discharged into tote box moving along with unit, and sand onto hopper at other end, also moving with the unit.

102. Vibrating Screens ➡

Small, sturdy, inexpensive vibrating screens developed by Screen Equipment Co., Inc., are designed to perform small screening jobs often done by hand and to screen foundry sand. Available in single, double and triple deck models in 1½ and 2 ft. widths x3, 4, 6 and 8 ft lengths. Positive eccentric action with maximum vibration amplitude of $^{3}/_{16}$ in. Speeds up to 1,150 rpm require only ½ hp.





⬅ 103. Jolt Squeeze Pin Strip Molder

A jolt, squeeze, pin strip molding machine developed by Arcade Mfg. Div., Rockwell Mfg. Co., is available in either portable or stationary models and will strip on exhaust stroke of squeeze, can be used as a push-off after squeeze. Furnished with pin strip or rail strip.

104. Aluminum Melting Furnace Control

An electric control developed by Leeds & Northrup Co. brings batch furnaces for melting aluminum quickly and accurately to temperature, improves castings quality by preventing gas inclusions and blowholes, and limiting high-temperature swings. Controller automatically turns off fuel supply at predetermined point, holds charge at pouring temperature. Lights signal when fluxing and pouring temperatures are reached.

105. Pattern Lacquer

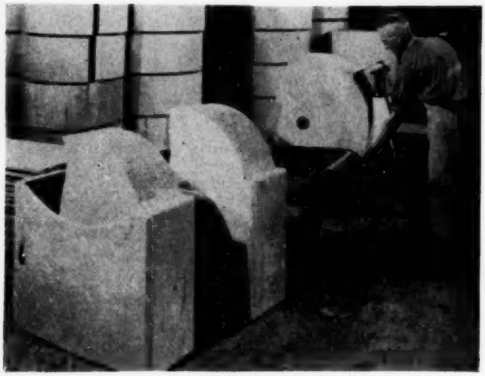
American Lacquer Solvents Co.'s pattern lacquer preserves pattern contours without distortion, promotes better wear, longer life. Features: smooth, hard finish, rapid drying, outlasts shellac, permits easy withdrawal from sand, resists abrasion, protects glued joints.

106. Industrial Peak Caps

Styled for safety, Wheeler Protective Apparel, Inc.'s peak caps are made either from featherweight asbestos, flameproof jean cloth, leather or wool. Features are long visor with fiber insert for shielding eyes and face, and seams with no exposed threads. Peak caps are available in sizes 6¾, 7, 7¼, 7½ and 7¾. Ear flaps that fold up into cap are optional at additional charge. Model 1050 is available in white, dark green, blue or brown.

107. Metal Cutting Process ➡

Arcos Corp.'s metal cutting process can remove a cast iron shoulder and set screw in 1 minute, cut 54½ in. of ⅜ monel in 20 minutes, using its holder and rods, a welding machine, a-c or d-c current and oxygen. Set up in one minute, this portable hand tool operates easily in any position, requires little instruction.



108. Portable Electric Sander

Weighing only 4¾ lb, Sterling Tool Products Co.'s low cost portable electric sander operates on the orbital motion sanding action, which permits sanding of parallel boards with opposing grain structures without risk of grit scars. Will remove surfaces and finish all types of wood, metal, composition and plastic products and parts.

109. Quartzite Rock Ganister

Used for many years as a highly refractory material in casting of steel and in electric furnaces, quartzite rock ganister has only recently received recognition as a patching material in cupola melting zones. Mined in South Dakota and distributed by Western Materials Co., Sil-O-Gan produces a monolithic lining that welds itself into a fused granite mass. Lining thus applied is not entirely burned away with each heat, forming an accumulation that forms a protective coat over the cupola block.

110. Fortifying Molding Sand

Keener Sand & Clay Co. has installed a large sand mixer at its Huron, Ohio, plant to produce fine molding sand for light gray iron, malleable and stove plate casting, in a new method which fortifies molding sand by the addition of a bonding agent. Varying percentages of bond are used to produce green strength to specification.

111. Ladle Additions

Literature dealing with the use of cerium (mischmetal) in producing nodular graphite structure in gray cast iron, and in improving the quality of magnesium, aluminum and other light metal alloys has been made available free of charge by the Cerium Metals Corp. to "Products Parade" readers.

112. Drafting Table

Two outstanding features distinguish Engineering Mfg. Co.'s four-post drafting table: (1) table top is of five-ply basswood; and (2) a wide, comfortable linoleum foot rest. A large variety of combinations and sizes, and accessories are available.

Products Parade, AMERICAN FOUNDRYMAN, *222 West Adams St., Chicago 6, Ill.*

Please send manufacturers' literature on the Products Parade items, indicated by circled numbers below, without cost or obligation to me.

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DIELECTRIC CORE BAKING

J. Wesley Cable, Consulting Engineer
Thermex Div., Girdler Corp.
Louisville, Ky.

Conventional methods of heating uniformly masses of non-metallic materials—usually poor thermal conductors—require transmission of heat energy from the outside to the innermost sections of the mass. In order to accomplish this without intolerable temperature gradients occurring from the surface inward, extremely slow heating is essential. Whether the material is heated by a high-temperature atmosphere surrounding the mass or by radiant energy falling directly on the surface, heat flow to the center must take place.

In the early days of radio development it was recognized that any insulator exposed to a high frequency alternating field would become heated as a result of dielectric hysteresis. This means that when a molecule of the material exposed to the field is distorted by its action, it does not release all of the energy that is transferred to it, and the small percentage which is retained shows up as heat energy and manifests itself as a temperature rise in the material.

Compare the molecule with a sponge rubber ball, and imagine this rubber ball being squeezed many millions of times per second. The probability that the ball will become hot is quite evident. But not only does one molecule produce heat; every molecule of the material, regardless of its location in the mass, produces heat if it is exposed to the high-frequency field.

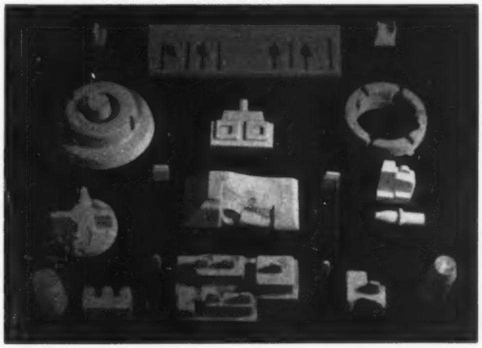
Fundamental Equipment

The elemental form of equipment for dielectric heating consists of an oscillator for producing the high frequency electrical energy and a pair of flat electrodes spaced some distance apart to allow introduction of the material to be heated. The polarity of the electrical potential between the plates changes many times a second in accordance with the frequency of the energy source, and when a non-conducting material is placed between these plates, the molecules of the material are deformed as this polarity changes.

The degree of deformation, and hence the amount of energy produced, is a function of the voltage applied to the electrodes, as well as some physical characteristics of the material such as power factor and dielectric constant. For any specified period of time, the total energy is proportional to the number of deformations during this time, so that the frequency, or number of reversals of force, is also a factor.

Equipment used for dielectric core baking is, in general, of the conveyor type, where the cores are passed between the electrodes progressively, and thus the heating cycle is governed by the speed of travel of the belt. In practice the belts travel from a few inches up to 10 fpm, depending upon the capacity of the equipment and the type of cores being baked. The belt is generally made of steel chain and acts as the bottom electrode. The units are flexible inasmuch as any desired length of conveyor can be supplied at either the entrance or exit end of the tunnel. Standard units allow approximately 4 ft of conveyor at the in-feed end and flush-end the conveyor at the exit to permit an auxiliary roller or belt conveyor to be used.

The atmosphere within the tunnel proper is at room temperature and the only thing heated is the material



Typical cores baked by dielectric heating. Cores are made by hand and core blowers from the same mix.

of the cores, thus eliminating waste heat. An exhaust blower on the top of the unit is used to carry off the steam and vapor evolved when the cores are baked. This should be piped to the outside atmosphere so that the gaseous products formed during the baking cycle do not become objectionable to operating personnel. The unit is completely housed with metal side panels, thus preventing a hazard to operators from the high voltages in the power supply. The units are thoroughly interlocked to prevent energizing if any access panels are removed.

Successful operation of dielectric core baking equipment is contingent upon the use of thermosetting resin type core binders, since there is no advantage

NOTE: This paper was presented at the 17th Annual Regional Foundry Conference of the A.F.S. Birmingham District Chapter, in Birmingham, Ala., Feb. 17-19, 1949.

gained in using a method that can heat the cores in a matter of a few seconds if the binder requires a few hours to set. Great advances have been made in the formulation and blending of thermosetting binders, which have increased the productivity and applicability of dielectric core baking equipment. A number of basic resins which lend themselves to use as core binders are available, among them being phenol-formaldehyde, urea-formaldehyde, the melamines, and the resorcinols. Each has its general field of application, with some specific advantages.

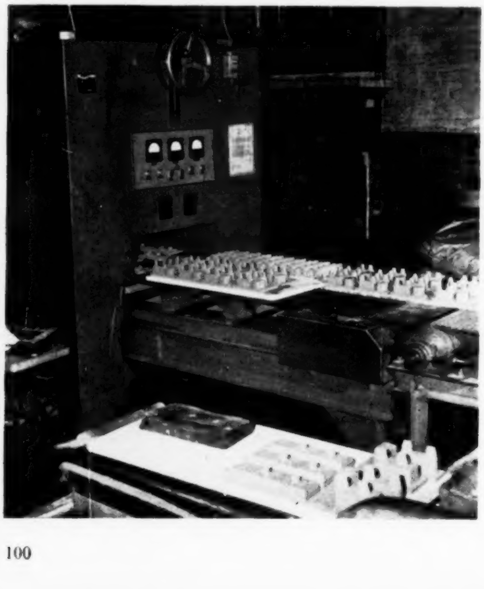
A blend of urea-formaldehyde and melamine, for instance, has proved to be the best general purpose binder found thus far, while a straight urea-formaldehyde runs a close second. The phenols have proved more successful with certain steels because they do not liberate nitrogen in breaking down, while lignite base and rosin binders have been found quite successful for gray iron and aluminum. The choice of binder, sand, and whether or not any further additions to the formulation are necessary, are more or less dictated by the geometry of the core and the requirements of green strength, collapsibility, hot strength and other characteristics.

Mixing Time Is Reduced

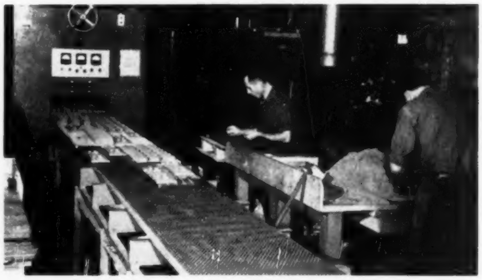
Green Handling: The mulling time required to mix the binder and sand may be greatly reduced in dielectric core baking. All standard mixers have been found suitable for the resin type core mixes. Savings are also reflected in the labor required per ton of sand.

It is possible, with proper location of the core baking tunnel, to load directly from the core bench, blower, or roll-over machine to the conveyor of the dielectric equipment, thereby eliminating the time and labor required in transporting the green cores to the conventional ovens. In many foundries the coremaker must walk from his respective position to a rack which is loaded into an oven, or to the conveyor oven itself which, because of its size and radiated heat, does not lend itself to location directly adjacent to the coremakers. The positioning of the core plates on the rack must be rather precise if good utilization of available rack space is to be made, and all this takes time from the coremakers' real job of making cores.

Cores of various shapes and sizes are passed into the dielectric heating unit for baking at the same time.



Baked Handling: The same procedure which is followed in loading racks or conveyors of conventional ovens is usually repeated in unloading, except that here the cores are hot and give off smoke and fumes, which makes them much more difficult to handle. They must be stacked for cooling prior to inspection, and when cool must be taken to the inspection table and the core plates returned to the coremakers. This obviously requires many man-hours of labor, which can be eliminated with dielectric core baking since a roller conveyor can be installed to take the core plates as they emerge from the tunnel and deliver them directly to the inspection table, cool enough for immediate inspection and service. Thus the same continuous flow of material which was achieved by the coremakers continues through to inspection.



View of core benches and infeed end of the conveyor.

Collapsibility and Shakeout: One of the outstanding characteristics of dielectric core baking and the resin binders associated with it is the excellent collapsibility and shake-out which can be obtained. Conventional oil binders, regardless of the particular type, go through stages of tarring, coking, and the final reduction of the coke to volatiles and ash. If this cycle is not completed for one reason or another, a hard mass results which must be broken out mechanically to remove the core from the cavity.

Synthetic resin binders of the type used with dielectric core baking equipment, on the other hand, break down directly into a white powder upon destructive distillation, and the sand pours from the cavity with the appearance of new dry core sand. There is no need to employ air hammers and the like for removing the core from the cavity.

Increase in Coreroom Yield: A coreroom where dielectric core baking equipment was installed had an over-all yield of 60 to 70 per cent using oil binders and conventional oven baking methods. When the dielectric baking equipment was installed and operating the core yield was increased to over 90 per cent.

A number of factors contributed to this increase in yield. There was far less handling in the green state, accomplished by the smooth production-line flow inherent to the dielectric method of baking. This means less damage to the cores when they are in the green state and most susceptible to damage. Such damage may occur from contact with foreign objects, and from vibration due to handling the core plates, placing them on the racks, and other such mechanical shock. The minimum amount of handling and freedom from vibration made possible by dielectric baking eliminates most of the damage from such sources.

Lessens Time in Green State

Sagging of the cores during the baking cycle is another cause of failure, and the degree of such damage is greatly dependent upon the length of time the core is retained in the green state. In conventional oven baking, the core is still green or only partially baked for a good part of its travel through the oven, and where the ovens are static, for a large part of the period it remains in the oven. The rapid curing accomplished by dielectric core baking eliminates slumping and sagging.

In conventional oven type baking the cores are subjected to non-uniform temperature distribution throughout the mass, and stresses are set up in the core due to uneven heating. These stresses are not apparent to visual inspection, and do not manifest themselves until the cores are placed in the molds and poured. When the core is subjected to the heat of the molten metal, cracks appear on the surface as a result of these trapped stresses, and the metal that runs into these stress cracks produces heavy fins which protrude from the cored surface. With the uniformity of heating brought about by dielectric heating, such stress cracking is completely eliminated, along with an improvement in dimensional stability by virtue of the short baking cycle, the uniform temperature, and the controlled low temperature required for baking.

Availability of Cores: The minimum baking cycle in conventional type ovens using oil binders is around 2 hr, and frequently runs longer, depending on the type of core and the mix. Also, considerable time is required for cooling after the cores are removed from the oven before they can be inspected and sent to the molding floor for use. Therefore, it is necessary to maintain a rather rigorous schedule in the coreroom to have cores available when they are needed on the molding floor.

Dielectric core baking does not require such scheduling, and makes immediately available any core that might be required on the molding floor. With heating cycles of the order of 20 sec to 2 or 3 min, cores can be baked as they are needed, and changes in molding schedules can be effected immediately.

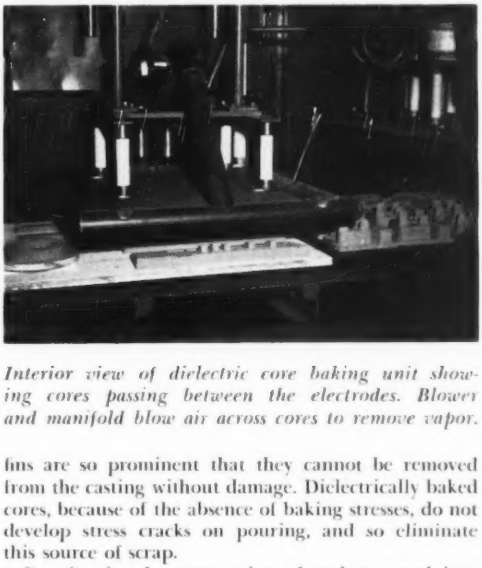
Mold and Core Venting Reduced

Negligible Gassing: Because of the relatively large amount of volatile matter driven off from oil cores when they are poured, it is often necessary to vent molds and cores to allow these gases to escape. This adds considerable work to the making of cores and molds, and also changes their physical characteristics and makes them more fragile. By using dielectric heating and resin binders, the necessity of venting molds and cores is greatly reduced because of the lesser amounts of volatiles given off. Also, the greater part of the smoke on the pouring floor is eliminated.

Rejected Castings: It has been found from general analysis of the over-all yields of many foundries that a large percentage of rejected castings is the result of poor coring, and dielectric core baking has proved its worth in increasing production where cores were the source of such rejects. Hot tearing is a defect which can be traced directly to the poor collapsibility of cores and molds.

An example of such a failure is an insulator bell which consisted of a thin section of metal surrounding a large core. The casting was gated at the edge of the bell, and with conventional oil cores, consistent hot tearing was encountered at the gate. When cores baked by dielectric heating and using resin binders were introduced, hot tearing was entirely eliminated.

Finning, which is caused by stress cracks being formed in the cores after they are poured, is also a major cause of scrap castings, since many times these



Interior view of dielectric core baking unit showing cores passing between the electrodes. Blower and manifold blow air across cores to remove vapor.

fins are so prominent that they cannot be removed from the casting without damage. Dielectrically baked cores, because of the absence of baking stresses, do not develop stress cracks on pouring, and so eliminate this source of scrap.

Burning in, the penetration of molten metal into the surface of the core and the presence of particles of sand in the metal after it has solidified, is an ever-present problem in the foundry. This means that "poor metal" is present at the surface of the casting that was formed by the core, and this metal must be removed if the casting is to be accepted. Many times this metal cannot be removed without changing the dimensions of the casting beyond the specified tolerances, and the castings are rejected. Resin binder cores baked dielectrically have unusually good resistance to burn-in, and the metal poured around them retains a good, clean surface, free from sand inclusions.

The tendency of cores is to expand and contract with changes of temperature during pouring, and when the

metal sets this produces changes in dimensions in the castings. While it is impossible to eliminate swelling and shrinking entirely, they are minimized in dielectrically baked cores. As a result, cores baked by this method produce castings which are closer to dimensional specifications.

Resin binders combined with dielectric heating have produced cores with high surface hardness, and castings made from them have extremely fine finishes. In fact, one aluminum foundry now using dielectric core baking is producing casting finishes which, prior to the use of this method, could only be obtained through the use of plaster molds. Indent hardness of 92 to 95, and scratch hardness of 88 to 90 are consistently obtainable without sacrificing collapsibility.

Reducing Number of Core Mixtures: For general coreroom requirements, it has been found that fewer formulations or mixes can be used for the over-all production. It is common practice, when using oil binders and conventional baking methods, to have a wide variety of mixes to take care of the particular requirements of certain cores. With resin binders and dielectric baking, it has been found that one fundamental mix, with two or three variations, can be used for all cores, regardless of their size or shape. Such a formulation might be as follows:

Sand (Jersey silica—70 mesh), lb.	500
Binder (urea-formaldehyde base), lb.	7
Boric acid, lb.	1½
Kerosene, qt.	1½
Cereal, lb.	3
Water, qt.	5½

This formulation provides good green strength, good hot strength, high surface hardness, and can be turned out of the core box without sticking or breaking fine edges. It can also be used in core blowers with good results, provided the boxes being blown are not too intricate in shape.

Where this is the case, the following variation of the elemental mix has proved itself well adapted to general purpose work:

Sand (Jersey silica—70 mesh), lb.	500
Binder (urea-formaldehyde base), lb.	11
Cereal, lb.	4½
Boric acid, lb.	1¼
Kerosene, qt.	2½
Water, qt.	8

This formulation produces higher surface hardness due to the increase in binder content, and also has a greater lubricity from the additional kerosene.

Where core with thin cross sections are to be made, a mix which produces a higher green strength and hot strength is needed, and the following formulation meets these requirements:

Sand (Jersey silica—70 mesh), lb.	500
Binder (urea-formaldehyde base), lb.	11
Cereal, lb.	4½
Boric acid, lb.	1¼
Dextrine, lb.	2½
Kerosene, qt.	3
Water, qt.	8

All of these mixes are mulled for 2 min dry, the water added and the mix mulled for another 2 min, the kerosene added and the mix mulled for 3 min. Experience has also shown that a binder of the urea-melamine blend base can be substituted in the foregoing formulations in the same proportions, and a core slightly superior in hot strength will be obtained. These mixes have been used for gray iron, malleable, brass, bronze, and aluminum, and in some cases, steel. However, the higher pouring temperatures generally encountered in steel foundries may indicate the use of one of the following formulations:

Sand, lb.	500
Silica flour, lb.	50
Cereal, lb.	2½
Binder (urea or urea-melamine base), lb.	6¼
Boric acid, lb.	1¼
Kerosene, qt.	1¼
Water, qt.	7½

Sand, lb.	500
Binder (phenol base), lb.	20
Kerosene, qt.	1¼
Water, qt.	10

(If higher green strength is desired, use up to 1 per cent cereal)

The mulling procedure for these formulations is the same as for the preceding mixes, and the choice between the urea- or phenol-base binders depends upon whether or not the nitrogenous compounds liberated by the urea binders affect the particular alloy steel being poured.

Some foundries have experimented to find a mix that meets their particular requirements best, and one gray iron foundry offers the following formulation, with some of the physical characteristics obtained:

Sand (mixture of Ashland bank sand, Marion sand, and New Jersey "D" sand), lb.	800
Binder (urea base), lb.	24
Boric acid, lb.	2½
Water, qt.	20

Baking cycle (dielectric), min.	2½
Scratch hardness, 97-98 avg leaving tunnel, 90 after exposure to moist mold of 6 per cent moisture for 6 hr	
Green strength, psi	1.5

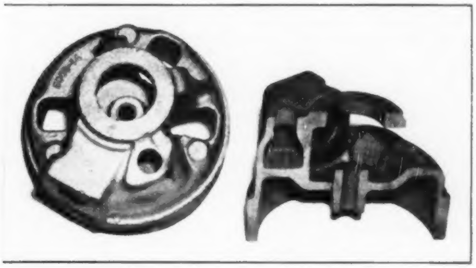
New Coring Techniques: Due to the advantages which have been pointed out, especially the superior shakeout characteristics and better finish, new coring

Coremakers loading plates on conveyor to dielectric core baking unit. Note the core blower and box used.

techniques are available to the foundryman through the use of dielectric core baking. First of all, it is unnecessary to provide relatively large openings to cored cavities to allow for sand removal, cleaning, and finishing.

The uniform baking obtained with dielectric heating permits a much greater latitude between heavy and thin sections, since with conventional oven baked oil cores the thin sections tend to overbake. The coremaker uses an oil can to saturate the thin sections to prevent overbaking those parts of the core, thus increasing the over-all cost.

Control of Properties: Many variables are imposed on a core during the usual baking cycle. Since these variables are eliminated in dielectric core baking, it is possible to readily adjust and control the green strength, hot strength, surface hardness, collapsibility, and other important qualities by simply adjusting the binder and water content of the mix, or by a slight variation in formulation. The rapid baking cycles of dielectric heating also make it possible to detect



Sectioned casting shows cavity formed by muffler core.

changes in physical characteristics a few minutes after the cores are made, and correct them immediately.

Driers—Wires—Chills: In dielectric core baking the effect of metal placed between the electrodes during the baking cycle must be considered. The power transmitted to the core is a function of the square of the voltage across the core, and it is desirable to make this voltage as high as possible. Therefore, if any electrical conductor, such as a reinforcing wire, were placed vertically for the full thickness of the core, in all probability a voltage flashover would occur and it would be impossible to bake the core. However, if this reinforcing wire were horizontal, in the plane of the electrodes, no harmful effect would ensue. The degree to which this wire can be off the horizontal must be determined for the particular core.

The same thing holds true for chills, and each case must be investigated individually. If the problem is reinforcing alone, it has been possible to substitute wood dowels and plastic pins for metal wires.

Due to problems of voltage failure, potential distribution and heat flow, metal driers and core plates can not be used in dielectric core baking. This is not a great problem as far as core plates are concerned, since many foundries are using asbestos board core plates, and these are satisfactory for dielectric heating. It is not necessary to use "heat treated" asbestos board plates since the core plates become only slightly warm in dielectric core baking.

Plywood plates have been used successfully in many foundries baking cores dielectrically, and a material similar to asbestos board but of about one third the weight is finding wide acceptance. Driers must also be non-metallic, and manufacturers are offering a plastic drier which can be made to the same tolerances as cast metal driers, is but a fraction of the weight, and stands up well in service. Some work has been done on blowing the cores directly into the plastic drier, but it has not been sufficient to determine practicability.

Plate and Drier Needs Are Reduced

The number of core plates or driers required is dictated by the core-baking procedure. For example, on the basis of two cores produced per minute, the conventional core oven on a 2-hr baking cycle would require about 300 driers, including spares. The same core, baked dielectrically on a 2-min cycle, would require about 24 driers.

Overbaking: It is impossible to overbake cores in the dielectric process since the heating characteristics of the core mix fall off rapidly as the cores reach the baked state. This is not the case with conventional type core baking. There is always a tendency toward hot-spots in ovens, regardless of design, and cores in these hot-spots, will bake more than cores in other parts of the oven. This results in overbaking of some cores, proper baking of others, and underbaking of a third portion. The degree of overbake and underbake may be reduced to the point where the compromise is acceptable, but it is still there. Also, the mechanism by which the heat enters the core in an oven makes thin sections susceptible to overbaking before the heavy sections come up to temperature.

Dielectric core baking insures that all cores going through the oven and all sections of the individual core are baked at the specified temperature. The uniformity of bake guarantees that the physical characteristics of the entire core are uniform, and possible poor physical characteristics at points unavailable for thorough inspection are eliminated. Thus, if one section of the core is inspected and found to have the proper qualities, it may be assumed that all sections of the core are satisfactory.

Thermal Efficiency Compared

Energy Consumption: The rating of a conventional oven is based on its maximum load and, in order to achieve the production indicated, all racks of the oven must be loaded to capacity, and there must be a minimum of door opening and random loading of racks. This is seldom possible, and the oven is often used at only a small percentage of its rated capacity. Fuel consumption, however, remains practically constant, regardless of the loading.

Dielectric core baking equipment consumes energy only when cores are being baked, and its over-all thermal efficiency remains more or less constant regardless of load, at approximately 50 per cent. Heat is not given off to the room where the equipment is located, which makes for better working conditions.

Space Saving: Standard ratings of dielectric core

Baked cores are removed from dielectric core baking unit and placed on racks for transfer to inspection.

baking equipment are in units of $\frac{1}{4}$-ton per hour of cores baked, and a typical $\frac{1}{4}$-ton unit will be approximately 5 ft wide, 17 ft long, and 7 ft high, with the exhaust duct extending from the top. The belt width varies from 2 to 3 ft, depending upon the manufacturer, and accomodates cores with over-all height up to 12 in. Entrance and exit conveyors can be furnished to suit the particular requirement of the user. There is a minimum of maintenance involved, since the only moving parts in the units are the conveyor and small blowers.

The tubes which are used to produce the high-frequency energy are especially designed for industrial service, and are available in both air-cooled and water-cooled types. If the coreroom is dusty, water-cooled tubes will probably give better service. Average tube life will run from 5,000 to 6,000 hr in this service.

As the rating of the unit goes up to $\frac{1}{2}$-ton per hour the size of the unit also increases, but does not double with capacity. One manufacturer has the feature of making the unit sectionalized, and its capacity can be increased by simply adding heating units and lengthening the conveyor. A unit rated at 1-ton per hour takes up approximately twice the floor space of a $\frac{1}{4}$-ton unit. Layouts can be made in which the dielectric heating units are located on a production line basis.

From the dimensions given the space saving realized through the use of this equipment is obvious. Vertical ovens often occupy three or four floors of the building. It is not uncommon to find horizontal conveyor ovens 150 to 200 ft in length and 10 or 12 ft wide. The erection cost of any oven must also be considered, and the only installation needed for dielectric core baking equipment is the setting of the unit in place, and the electric and water services which must be brought to it. The equipment is relatively light in weight and does not require special foundations.

Fuel Consumption: Cores can be baked dielectrically using 120 kwh per ton of cores baked, and at prevailing power rates of 1c per kwh, this is $1.20 per ton. The fuel costs for gas- and oil-fired ovens vary with location and type of oven. For instance, with a gas-fired oven, a foundry served by the Big-Inch pipeline with natural gas figures fuel cost at $0.87 per ton of cores, while an oil-fired oven in Pennsylvania runs $2.60 per ton.

Also to be considered is the small amount of maintenance necessary in dielectric core baking. There are no start-up or shut-down losses, and if minor repairs are necessary, the maintenance man can do his work without waiting for the oven to cool.

Acknowledgment

The author wishes to acknowledge the courtesy of Crompton & Knowles Loom Works, Worcester, Mass., and Lehigh Foundries, Inc., Easton, Pa., in furnishing the illustrations used in the paper.

Future Meetings and Exhibits

Society for Experimental Stress Analysis, spring meeting, Hotel Statler, Detroit—May 19-21.

Malleable Founders' Society, western sectional meeting, Palmer House, Chicago—May 27.

Electric Metal Makers Guild, 17th annual meeting, Bismarck Hotel, Chicago—June 2-4.

Steel Founders' Society of America, industrial relations meeting, Drake Hotel, Chicago—June 9-10.

Institute of British Foundrymen, 46th annual conference, Cheltenham Spa, England—June 14-17.

Malleable Founders' Society, annual meeting, Homestead Hotel, Hot Springs, Va.—June 16-17.

American Society for Testing Materials, annual meeting, Atlantic City, N. J.—June 27-July 1.

Instrument Society of America, 4th national instrument exhibit, St. Louis Municipal Auditorium, St. Louis—Sept. 12-16.

American Society for Testing Materials, Pacific Coast Meeting, Fairmount Hotel, San Francisco—Oct. 10-14.

Steel Founders' Society of America, fall meeting, Ambassador Hotel, Los Angeles—Oct. 13-14.

Foundry Equipment Manufacturers Association, annual meeting, The Greenbrier, White Sulphur Springs, West Virginia—Oct. 13-15.

American Society for Metals, metal congress and exposition, Public Auditorium, Cleveland—Oct. 17-21.

Gray Iron Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago—Oct. 27-28.

National Foundry Association, annual meeting, Waldorf-Astoria Hotel, New York—Nov. 9-11.

Michigan Regional Foundry Conference, A.F.S. Michigan Chapters, Michigan State College, East Lansing—Nov. 15-16.

New York State Regional Foundry Conference, A.F.S. Upstate New York Chapters, Syracuse University, Syracuse, N. Y.—Nov. 25-26.

NEW YORK TECHNICAL INSTITUTE OFFERS FREE FOUNDRY COURSES

DESIGNED TO MEET THE NEEDS OF LOCAL INDUSTRY and at the same time to afford high school graduates tuition-free technical training, the New York State-sponsored Institute of Applied Sciences at Buffalo is offering a two-year course in metallurgical technology to New York residents.

Although there are five such educational institutions sponsored by the state, the Buffalo Institute is the only one offering a metallurgy course. The reason for this is that an intensive survey in 1946 showed that the heavy concentration of foundries and allied metals industries in the Buffalo area has created a wide demand for metallurgical technicians.

Members of the Western New York Chapter of the American Foundrymen's Society have been instrumental in the establishment of the Institute's metallurgical course, particularly through the efforts of the Chapter's Educational Committee, under the chairmanship of John C. Nagy, Charles C. Kawin Co.

Professor Otto V. Guenther, head of the Institute's Metallurgical and Mechanical Technology departments, is assisted by three advisory committees, personnel of which includes the following members of the A.F.S. Western New York Chapter: Herbert I. Cutler, Bethlehem Steel Co.; Erwin Deutschlander, Worthington Pump & Machinery Corp.; Leonard A. Greenfield, Samuel Greenfield Co., Inc.; John C. Nagy, Charles C. Kawin Co.; and Ralph T. Rycroft, Sr., Kencroft Malleable Co., Inc.

Local Cooperative Training Established

With the aid of the committees, Professor Guenther ordered equipment for the course, planned class and laboratory work and established a cooperative training program in local industry.

Institute training of metallurgical technicians covers two full years, each divided into four quarters of 12 weeks each. Three months of each year is spent in cooperative training in industries within the Buffalo area, and the other nine months are devoted to laboratory and classroom work.

Subjects studied in the first year include technical mathematics, applied physics (heat), general chemistry, foundry laboratory, machine tools, mechanical drawing, industrial electricity, and physical metallurgy.

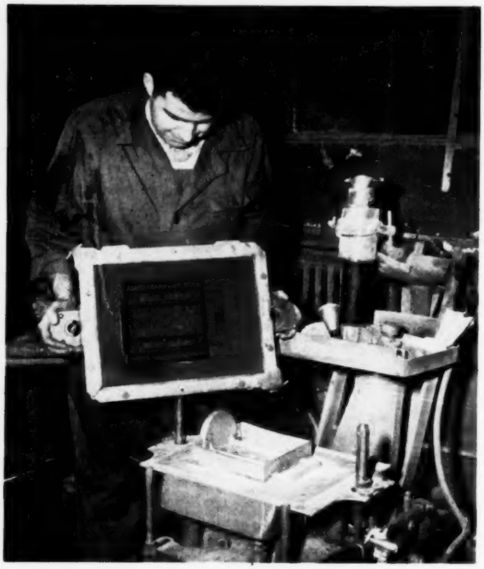
Classes in physical metallurgy and machine tools are also included in the second and final year's curriculum, plus six developing subjects—technical mechanics, inspection, production methods, industrial instruments, strength of materials and spectroscopy. As a result of class and laboratory which interlocks with cooperative training in western New York plants, instruction is practical and provides the student with a solid grounding in the fundamentals of metallurgical technology. As a result, Institute students are already in considerable demand although the first class will not be graduated until September of this year.

"Credit for the success of the course is due in a large part to the local members of the American Foundrymen's Society for their assistance with advice, their helpfulness in consultation, and their aid in making possible on-the-job training," Professor Guenther said recently, "and we are fortunate in having Keith Williams, Pratt & Letchworth Co., co-chairman of the A.F.S. Western New York Chapter's Educational Committee, as president of the Buffalo Board of Trustees."

A four-year extension course for instruction of foundry apprentices, covering all major phases of foundry work, is now under consideration by the New York Board of Education. If approved and incorporated in the curricula of the Institute of Applied Arts and Sciences, this will prove a major step in the advancement of foundry education and in attracting young men to Buffalo area foundries.

Instructor David Stein and Glenford Nash, service engineer, run the first heat on the Institute of Applied Arts and Sciences' electric rocking furnace.

Institute of Applied Arts and Sciences students running a compression test on a sand testing machine.



Cope half of mold made on jolt-squeeze pin-lift molding machine by C. W. Keith, foundry student and member of Ohio State University Student Chapter of A.F.S.

FOUNDRY-OPTION AT OHIO STATE UNIVERSITY

D. C. Williams
Assistant Professor
Dept. of Industrial Engineering
The Ohio State University
Columbus, Ohio

In recent years the foundry industry has become increasingly interested in university and college trained students. Long before the current emphasis on special college training and scholarships, Ohio foundrymen had been urging the college of engineering at Ohio State University to give more attention to training students for the foundry field. In the summer of 1947, direct action was taken by the University to expand the foundry area in the department of industrial engineering..

Beginning with only one course in foundry practice the college of engineering and University faculties adopted an expanded foundry curriculum that far exceeded the hopes of foundrymen around Columbus. Known as the foundry-option in industrial engineering, the term indicates a field of specialized training within the general curriculum of the department. In order to make room for foundry technology courses in the industrial engineering curriculum certain regular courses had to be dropped. For the foundry-option it was decided that courses pertaining to design would be replaced by foundry courses. However, the student has available several hours for technical elective courses and can obtain the design courses.

Local Foundries Cooperate

It is a tribute to the local foundries that they have given every measure of cooperation asked of them. In order to promote student interest in the industry these foundries have opened their doors for inspection trips for groups whose numbers vary from two to 40. Many foundries during the past summer inaugurated student training programs in their organizations which enabled the students to obtain an over-all picture of foundry operations. On one inspection trip students were accompanied by wives and sweethearts who learned that "The Foundry is a *Good* Place to Work."

Since 1925 the foundry area has been under the jurisdiction of the department of industrial engineering. This may seem unusual, but to produce castings a foundry is confronted with many production problems requiring the attention of trained personnel with an engineering background. A student in the department of industrial engineering is engaged in obtaining a fundamental background in production problems of engineering industries. Therefore, a foundry area in the department of industrial engineering is logical.

A student completing the foundry-option will have a background for cost control, quality and production control, safety engineering, management of men in an engineering industry, plant layout, engineering economy, methods study and foundry technology.

Research Facilities Provided

We have not neglected the foundry industry needs for research to improve products and manufacturing methods. To provide this needed research our development program extends into the graduate school level. Students can obtain the Master of Science and Doctor of Philosophy degrees with a major in foundry technology or some other area of industrial engineering. Modernization of the Ohio State University foundry laboratory is proceeding along lines which soon will provide research facilities.

A student electing the foundry-option does not vary his course of studies from that of a regular industrial engineering student until the winter quarter of the third year. Table 1 gives the curriculum of the foundry-option for the third, fourth and fifth years. The first two years of the curriculum is composed of prerequisite courses in chemistry, physics, mathematics, engineering drawing, economics, welding, machine shop and the introductory foundry course. In the third year, autumn quarter, will be found a course in statistical methods in engineering, a special course for industrial engineering students. In the same quarter

students become acquainted with accounting problems and production control charts. A "broadening" course is included in the field of social administration. Each quarter of the third and fourth years the curriculum calls for one such "broadening" course. The inclusion of these courses is one of the features of the five-year plan[1] of the college of engineering.

In the winter quarter of the third year students who elect the foundry-option find their curriculum varying from that of the regular industrial engineer. Courses in ceramics and foundry molding methods are required. In the spring quarter the student takes his first course in metallurgy. At this time he also studies labor problems and labor management.

During the summer period the student must work in an engineering industry and submit to the faculty a report of his work experiences. It will be noted that the curriculum again calls for summer work between the fourth and fifth years which also requires a written report of the students activities and observations. At the end of the winter quarters of both the fourth and fifth years the student goes on inspection trips. Foundry-option students accompany the regular industrial engineering students. On these trips the students observe from seven to ten different types of industries.

In the fourth year the student has courses in electrical and mechanical engineering subjects as well as advanced courses in industrial engineering. Foundry materials are covered in two quarters, autumn and winter. The first course is given in the department of ceramic engineering and the second course, concerned with organic materials, is in the department of industrial engineering. In the spring quarter, foundry casting control is taught. This course correlates the work

[1]P. N. Lehoczky, "The Five-year Curriculum at the Ohio State University," *Journal of Engineering Education*, Vol. 37, Nov. 1946

TABLE 1 — FOUNDRY OPTION IN INDUSTRIAL ENGINEERING — FIVE-YEAR COURSE

The following curriculum indicates the requirements for the degrees of Bachelor of Industrial Engineering and Master of Science. For the latter, the students must fulfill the extra requirements.

FIRST AND SECOND YEARS

(Standard Industrial Engineering Curriculum)

THIRD YEAR

Autumn Quarter	Winter Quarter	Spring Quarter	Summer Quarter
Statistical Methods in Engineering ... 5	Statics ... 5	Strength of Materials ... 5	Practical Experience in an Industrial Organization .. 6
Outline of Accounting ... 5	Introduction to Ceramics .. 4	Psychological Problems in Engineering ... 3	
Engineering Drawing ... 3	Factory Costs ... 5	Labor Problems ... 3	
Production Control Charts . 3	Introduction to Political Science ... 3	Personnel Management ... 4	
Social Work—Its Structure and Function .. 3	Foundry Molding Methods ... 3	Principles of Metallography ... 4	
Total 19	Total 20	Total 19	Total 6

FOURTH YEAR

Autumn Quarter	Winter Quarter	Spring Quarter	Summer Quarter
Time and Motion Study ... 5	Electrical Engineering or Electronics ... 4	*Laws of Engineering Management ... 3	Practical Experience in an Industrial Organization .. 6
Electrical Engineering ... 4	*Advanced Production Control ... 3	Time and Motion Study Laboratory ... 4	
Advanced English for Engineers ... 3	Corporate Organization and Control ... 3	Applied Thermodynamics .. 4	
*Engineering Economy ... 3	Foundry Materials ... 3	Fundamentals of Economic Geography ... 3	
Ceramic Foundry Materials ... 3	*Metallography of Iron and Steel ... 4	*Foundry Casting Control ... 3	
Total 18	Total 17	Total 17	Total 6

Inspection Trip ... 2

FIFTH YEAR

(For B.I.E. degree only)

Autumn Quarter	Winter Quarter	Spring Quarter
Senior Assembly ... 0	Senior Assembly ... 0	Senior Assembly ... 1
General Conference Course ... 1	*Industrial Quality Control ... 3	*Foundry Melting Methods ... 3
*Safety Engineering ... 3	General Conference Course ... 1	General Conference Course ... 1
*Foundry Casting Methods ... 3	*Foundry Heat Treating of Castings ... 3	Technical Elective ... 6
Technical Elective ... 6	Technical Elective ... 6	Non-technical Elective ... 5
Non-technical Elective ... 5	Non-technical Elective ... 5	
Total 18	Total 18	Total 16

Inspection Trip ... 2

*May be taken for graduate credit

on foundry molding methods and two courses concerning foundry materials as they are related to casting defects. There is a foundry course in each quarter of the students' fifth year. In the autumn quarter the foundry casting methods course covers all methods except static casting with sand molds. Foundry heat treating of castings is given in the winter quarter, and foundry melting methods in the spring quarter.

Table 1 shows that in each quarter of the fifth year six hours are available for the technical elective courses and five hours for the non-technical electives.

As an extra-curricular activity there is a student chapter of the American Foundrymen's Society composed of 40 enthusiastic members. Personnel currently engaged in foundry work can get the training provided by the foundry-option. Such personnel must have a background that meets the entrance requirements of the University and must enroll in the engineering college under the five-year program. At present there are no special foundry scholarships available to financially aid such students. All students are, however, eligible for the regular scholarships.

CENTRAL N. Y. CHAPTER IS HOST TO EDUCATORS

John A. Feola
Crouse-Hinds Co.
Syracuse, N. Y.

NEARLY 50 VOCATIONAL GUIDANCE DIRECTORS and educators from high schools of the Central New York area were guests at the April meeting of the A.F.S. Central New York Chapter, held on the campus of Cornell University, Ithaca.

An afternoon and evening session were devoted to a program in which prominent foundrymen and educators explained the opportunities open to young men in the foundry industry. The meeting was held in cooperation with Cornell University and the Foundry Educational Foundation, and was attended by some 70 chapter members, in addition to the educators.

Professor M. S. Burton of the School of Chemical and Metallurgical Engineering, Cornell University, welcomed the visitors and explained Cornell's part in the Foundry Educational Foundation Program.

Following this, George K. Dreher, executive director of the Foundry Educational Foundation, pointed out that the foundry industry is the fifth largest durable goods industry in the nation and employs more than 500,000 people. Mr. Dreher cited the reasons why the FEF was formed and told of a number of careers open to young foundry engineers.

Many Openings for Skilled Men

J. O. Ochsner, Crouse-Hinds Co., Syracuse, addressed the group on *"The High School Graduate in the Foundry Industry,"* in which he outlined briefly the advances in foundry science in recent years and compared the wages of skilled help in the foundry with those in comparable industrial fields. Mr. Ochsner concluded by describing the many skilled crafts open in the foundry industry for high school graduates, and by stating that the foundry can use young men with initiative.

Dr. H. F. Rhodes, director of Cornell's School of Chemical and Metallurgical Engineering, concluded the afternoon session with a discussion of foundry engineering courses at Cornell University.

Following Dr. Rhode's talk, the group was conducted through the University's Metallography, Sand Testing and Foundry laboratories, where faculty members described equipment and operations.

C. M. Fletcher, Fairbanks Co., Endicott, N. Y., chairman of the Central New York Chapter, opened the evening technical session with an expression of thanks to Cornell University and the FEF for their cooperation, and introduced the evening's technical speaker, Harry W. Dietert, Harry W. Dietert Co., Detroit, who spoke on the *"Relation Between Casting Defects and Physical Properties of Foundry Sands."*

Mr. Dietert opened his address by citing the opportunities that exist in the foundry industry for a student with a creative mind, and added that foundry work is interesting because it constantly offers a variety of problems to be overcome.

The speaker then described foundry sand as an engineering material and showed how characteristics are controlled and changed to meet the varied requirements of molding and coremaking.

Central Illinois Chapter Members Design and Cast "Mascot" Statuette

CENTRAL ILLINOIS CHAPTER'S METAL STATUETTE, appearing periodically in AMERICAN FOUNDRYMAN'S *"Chapter Activities News"* has occasioned many inquiries from readers as to its origin.

In respone to the request of Walter West, Director, Leyland Motors Limited, Leyland, Lancashire, England, Central Illinois Chapter Chairman F. W. Shipley,

Caterpillar Tractor Co., has revealed that the statuette was designed by a Caterpillar patternmaker who has a marked talent for woodcarving.

Using this woodcarving as a pattern, Superior Foundry Co., Peoria, Ill., whose members belong to the Chapter, cast the statuette in bronze. Metal patternmaking apprentices at Caterpillar made the ladle and mold with its jacket to exact scale from a piece of solid bronze. The company's wood patternmaking apprentices made the mahogany base for the figure.

FOUNDRY RECORDS AID CONTROL

Sixth in a series dealing with modern cupola operation, this paper is sponsored by the Cupola Research Committee of A.F.S. Previous papers appeared in the March, April, May, October and December, 1948 issues of *American Foundryman*.

RECORDS ARE A MEANS to progress. They are often the basis for improvement and changes in technique, and if frequently and properly used they are invaluable. All records should be periodically inspected to detect trends and errors requiring correction. They should be filed in a loose-leaf post binder or some device permitting rapid comparison.

The record forms accompanying this paper are limited to the group pertaining to the cupola. Since forms must meet individual foundry needs, those presented here are intended only as guides in making such forms. Some of them may need expansion, while others contain more detail than may be necessary. Each foundryman must determine his needs and set up his records accordingly.

1. Segregation of incoming materials is imperative since they vary from lot to lot. A "Yard Record" is a convenient way to keep them straight in the bins. This record can also be used as a running material inventory. The total weight of the raw materials consumed can be taken from it and reported to the accounting department. In the cases where forms and procedures have been set up by the accounting department this form would be unnecessary duplication.

Such a form provides the best reference for the calculation of mixtures and charge compositions.

2. The "Daily Mixture Calculation Sheet" is a practical way of figuring the charge composition. It is desirable to recompute all charges daily. If filed it can be used as a means of back-checking a mixture and estimated analysis. A recalculation on a new charge sheet should be made each time a different car or bin is used, and a new mixture number should be assigned.

Use Charge Material Analyses

In making the computations it is best to use the material analyses if they are available. Otherwise, the figures in Table 4, page 53, of the A.F.S. HANDBOOK OF CUPOLA OPERATION can be used as an approximation. Gain and loss of elements during melting are established for each operation through this set of calculations. The line headed "Melting Gain or Loss" should be adjusted from time to time as changes occur in the operation of the cupola. To begin computations, approximate figures for melting gain or loss are found in Table 4a, page 54, HANDBOOK OF CUPOLA OPERATION.

3. Each molding floor foreman should determine what the requirements will be for his floor. The total should then be given to the metallurgist or cupola foreman who makes the "Charging Schedule." After completion the "Charging Schedule" is given to the cupola charging crew foreman. For double checking the intended analysis the "Computed Mixture Analysis" is shown on the schedule.

4. All data pertaining to the operation of the cupola can be entered on the "Cupola Record." The lining dimensions taken before and after the heat show the amount, location, and type of burn-out. The rest of the form provides a convenient method for directing the cupola operation under the various conditions.

5. "Cupola Daily Log" is a record of the metal temperatures, blast conditions, and chill depths. It should be coordinated with the "Total Ladle Treatment" record.

6. "Total Ladle Treatment" is a record of the alloying and inoculating procedure at the cupola.

7. The "Daily Metal Control Report" is divided into two parts—chemical tests and physical tests. This form incorporates all of the chemical and physical data of the iron melted in the cupola. The data should be obtained at a regular time interval throughout the heat. Taking the ladle analyses from only a couple of ladles is not sufficient because it does not show the *trend* of the cupola operation. The data on this form should be plotted daily, if necessary, to determine the variations of the operation. If the analyses and properties do not conform to the specification, steps should be taken immediately to correct such deviations. The average analysis from this record is used as the analysis of the returns in computing the cupola charge.

8. The "Casting Work Sheet" permits each molding floor foreman to record his requirements and to determine the amount and type of casting rejection.

9. Casting inspection should be carried out prior to casting testing. The "Inspector's Daily Report" is the

CUPOLA RECORD

Cupola No. ________ Date ________

Inside Diameter of Lining:

	Before	After
Diameter of Well		
Diameter at Top of Main Tuyeres		
Diameter 6 inches above Top of Main Tuyeres		
" 12 " " " " " "		
" 24 " " " " " "		
" 36 " " " " " "		
" 48 " " " " " "		

Distance From Bottom of Tuyeres to:

Center of Tap Hole ______ Top of Sand Bottom at Tap Hole ______
Center of Slag Hole ______ Top of Sand Bottom at Slag Hole ______

Bed Preparation:

Light-up Time ______ Bed Height, Above Tuyeres ______
Weight of Coke in Light-up ______ Size of Bed Coke ______
Weight of Coke Fanned ______ Coke Brand ______
Weight of Coke, Full Bed ______ Weight of Limestone on Coke Bed ______
Remarks: ______

Filling the Cupola:

Number of Metal Charges ______ Number of Limestone Charges ______
Weight of Metal Charges ______ Weight of Limestone Charges ______
Number of Coke Charges ______ Time Filling Cupola: ______
Weight of Coke Charges ______ Start ______
Size of Coke in Fill Charges ______ Finish ______
Extra Coke in Fill Charges ______
Remarks: ______

Heat Record:

Time Blast On ______ Duration of Heat, Hours ______
Time of First Iron At Tuyeres ______ Tons Melted ______
Time of First Iron At Tap Hole ______ Down Time ______
Time of First Tap ______ Tapping Hours ______
Last Charge On ______ Heat Melting Rate ______
Blast Off ______ Lb Coke Used per Net Ton ______
Time Bottom Dropped ______ Melted ______
Remarks: ______

DAILY MIXTURE CALCULATION SHEET

Mixture No. __________ Heat No. __________ Cupola No. __________ Date __________

Material Charged	Per cent	Pounds Per Charge	Carbon %	Carbon lb	Silicon %	Silicon lb	Manganese %	Manganese lb	Sulphur %	Sulphur lb	Phosphorus %	Phosphorus lb
Pig Iron, Low P Malleable												
Pig Iron, Foundry												
Silvery Piglets												
Returns												
Purchase Scrap												
Cast Iron Briquettes												
Steel Briquettes												
Steel Scrap												
Other												
Total												
Analysis Charged (Totals Divided by Pounds per Charge												
Melting Loss or Gain												
Estimated Analysis												

CASTINGS WORK SHEET

Shop Order	Pattern No. or Description	Av. Weight	No. Of Pcs. Molded	No. Of Pcs. Poured	Labor Cost Rate	Labor Cost Hr or Pcs.	Labor Cost Amt.	Molder and Helper	Total Weight for Each Pattern Made	Bad Weight	Bad Defec No

CHARGING SCHEDULE

Date __________

Cupola No. __________ Heat No. __________

Type of Iron __________

Mixture No.				
	lb	lb	lb	lb
Pig Iron, Low P Malleable				
Pig Iron, Foundry				
Silvery Piglets				
Returns				
Purchase Scrap				
Cast Iron Briquettes				
Steel Briquettes				
Steel Scrap				
Other				
Total Weight				
Coke				
Limestone				
Fluorspar				
Manganese Briquettes				
Other				

DAILY METAL CONTROL REPORT

KIND OF IRON __________ DATE __________

CUPOLA NO. __________

Pouring Time				
Mixture No.				

CHEMICAL TESTS

Total Carbon				
Combined Carbon				
Graphitic Carbon				
Manganese				
Sulphur				
Phosphorus				
Silicon				
Nickel				
Chromium				
Molybdenum				
Vanadium				

PHYSICAL TESTS

Brinell Hardness				
Chill Depth				
Transverse Str.				
Tensile Str.				
Deflection				
Spout Temp.				
Blast, oz				

COMPUTED MIXTURE ANALYSIS

Element	Per Cent	Per Cent	Per Cent	Per Cent
Carbon				
Silicon				
Manganese				
Sulphur				
Phosphorus				

CUPOLA DAILY LOG

Time	Iron Temperature, F Tapping Hole	Iron Temperature, F Fore-Hearth	Pressure, oz	Blast Volume, cfm	Moisture, gr/cu ft	Chill Depth, 32nds	Rem

CASTING TEST RECORD

No.	Brinell	Hydrostatic Test Good	Hydrostatic Test Bad

TOTAL LADLE TREATMENT

Tap No.	Fore-hearth Soda Ash, lb	Ladle Chill Reducing Inoculant, lb	Ladle FeCr, lb	Ladle FeMo, lb	Ladle FeV, lb	Ladle F-Ni, lb	Other

INSPECTOR'S DAILY REPORT

Date Cast __________ Date Inspected __________

Casting	Floor	No.	Weight	DEFECT 1. Blow	2. Scars and Plates	3. Shrink	4. Hot Tears	5. Cracks	6. Hard-Chilled Spots	7. Warped Casting	8. Open Grain	9. Misrun	10. Coldshut	11. Inclusion	12. Scabs, Erosion	13. Scabs, Expansion	14. Drops	15. Stickers	16. Rough Surface	17. Swells	18. Shift	19. Core Raise	20. Cores Wrong	21. Runout	22. Bleeders	23. Poured Short

YARD RECORD

Date	Bin No.	Material	Source	Weight Previous	Weight Added	Weight Used	Weight On Hand

form provided for recording the casting defects. They can be recorded by placing check marks or the number of such cases in the proper square. This report is then coordinated with the "Casting Work Sheet." Although a few defects are noted, the list is by no means complete. It would be advisable to change it so that it will conform to the needs of the individual foundry. When a defect occurs frequently, the metallurgist or cupola foreman, the molding floor foreman, and the inspector should discuss the casting and defects and determine ways and means of eliminating the difficulties.

10. The "Casting Test Record" is the final check made on a casting before shipment. If all the castings are tested and a serial number has not been cast into each one, they should be numbered with paint. This will permit tracing the castings through the foundry in the event they are found to be defective after delivery to the customer.

ANNOUNCE CHAPTER APPRENTICE CONTEST WINNERS

SEVEN LOCAL APPRENTICE CONTESTS were held this year by Chapters of the American Foundrymen's Society in conjunction with the 1949 A.F.S. National Apprentice Contest. Those sponsoring local contests were the Northern California, St. Louis District, Washington, Wisconsin, Detroit, Northeastern Ohio and Eastern Canada & Newfoundland Chapters. Winners in gray iron, steel and non-ferrous molding and in patternmaking in each of these local contests were selected to represent their respective Chapters in the 1949 A.F.S. National Apprentice Contest, whose first place winners received cash awards and a trip to the 53rd A.F.S. Convention in St. Louis, May 2-5.

The largest number of molding and patternmaking entries in its history were reported by the Wisconsin Chapter—21 entries in the molding divisions and 24 in the patternmaking contest.

Winners in the various divisions of the Wisconsin Chapter's Apprentice Molding Contest were:

Gray Iron—Kenneth Kolbrak, Koehring Co., Milwaukee, 1st Prize; Carl Young, Koehring Co., 2nd Prize; Victor Radloff, Brillion Iron Works, Brillion, Wis., 3rd Prize.

Steel—Raymond Lipowski, Bucyrus-Erie Co., 1st Prize; Gilbert Brickler, Maynard Electric Steel Castings Co., Milwaukee, 2nd Prize; John Reszka, Maynard Electric Steel Castings Co., 3rd Prize.

Non-Ferrous—Edmund J. Skowronski, Ampco Metal, Inc., Milwaukee, 1st Prize; Ervin Novak, Allis-Chalmers Mfg. Co., Milwaukee, 2nd Prize; John Wegener, Waukesha Foundry Co., Waukesha, Wis., 3rd Prize.

Raymond J. Lipowski, winner of the Chapter's Steel Molding Division contest, was judged first prize winner in the Steel Molding Division of the A.F.S. National Apprentice Contest this year in St. Louis. Edmund J. Skowronski, winner of the Chapter's Non-Ferrous Molding Division contest, was awarded third prize in the Non-Ferrous Molding Division of the National Contest (see story on page 50).

Winner of the Wisconsin Chapter Apprentice Patternmaking contest this year was Ervin Kulinski, Allis-Chalmers Mfg. Co., Milwaukee. Second place was awarded Anthony Panacek, Bucyrus-Erie Co., Milwaukee, and third prize to Henry Adamczyk, also of the Bucyrus-Erie Co.

Chairman of the Wisconsin Chapter's 1949 Apprentice Contest Committee was Andrew A. Bottoni, foundry instructor, Milwaukee Vocational School.

Northern California Chapter's local Apprentice Contest, conducted under the chairmanship of J. L. Francis, Vulcan Steel Foundry Co., Oakland, drew 20 contestants in the various molding divisions. First prize in all three molding divisions was awarded to apprentices of the General Metals Corp., Oakland. Winners are: *Gray Iron Molding*, Francis Cox; *Steel Molding*, Elmer Hollibaugh; and *Non-Ferrous Molding*, Memphis Jenkins.

Sponsored by the host chapter to the 1949 A.F.S. Convention, the St. Louis District Chapter's 1949 Apprentice Contest had seven entries in molding and eight in patternmaking.

Winners in the Chapter's Patternmaking Contest and winner of first prize in the A.F.S. National Apprentice Contest was William Burkholder, Central Pattern Co., St. Louis.

The three first prize winners in the A.F.S. Northern California Chapter's 1949 Apprentice Molding Contest were all from General Metals Corp., Oakland, Calif. Shown with company personnel manager Elko Sabatini, (second from left), are, starting left, Elmer Hollibaugh, gray iron division; Francis Cox, steel division, and Memphis Jenkins, non-ferrous division.

Participating companies in the St. Louis Chapter's contest were St. Louis Steel Casting Co., Carondelet Foundry Co., Semi-Steel Casting Co., and the National Bearing Division of the American Brake Shoe Co., all of St. Louis.

Members of the St. Louis Chapter's Local Apprentice Training Committee are A. W. Burgdorfer, Missouri Pattern Works, chairman; A. S. Hard, St. Louis Steel Casting Co., N. L. Peukert, Carondelet Foundry Co., and Howard Stoults, National Bearing Division, American Brake Shoe Co., all of St. Louis.

EDITOR'S NOTE: Information on other Chapter Apprentice Contests will appear in the June, 1949, issue of AMERICAN FOUNDRYMAN.

FOUNDRY OPEN HOUSE MARKS BADGER STATE UNIVERSITY CENTENNIAL

Richard W. Heine
Assistant Professor
Metallurgical Engineering
University of Wisconsin

Celebrating the 100th anniversary of the birth of the University of Wisconsin, the University's College of Engineering on March 15 opened its doors to the public in a day-long open house, affording visitors an opportunity to witness the school's instructional and research activities in normal operation.

One of the most popular features of the College's open house was the Metal Casting Laboratory, where foundry instruction and operations were performed for the visitors' observation. A special attraction was the casting of souvenir plaques (see illustration at top of page), which were presented to all visitors to the laboratory.

This and other foundry operations were carried out by students attending the University on Foundry Educational Foundation scholarships. These young men, who also acted as guides for the visitors, served to emphasize the University's interest in educational preparation for the foundry industry.

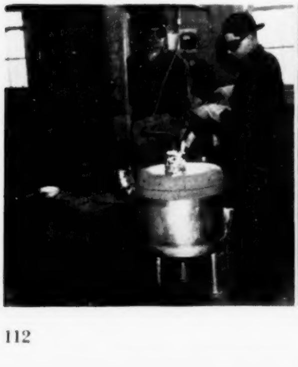
The pattern for the souvenir plaque was constructed by Metallurgical Engineering Senior Edwin Baugh. The original pattern was carved in wax, reproduced in a plaster mold, and finally cast in aluminum.

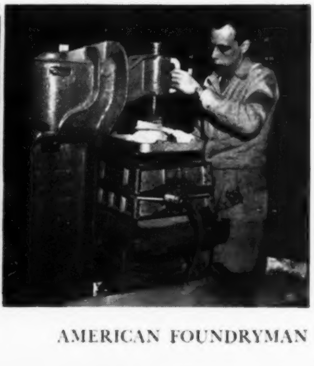
The castings were then poured in green sand molds, using a natural molding sand. Finishing of the castings required only a grinding and polishing operation to bring out the highlights of the as-cast surface. The lettering, scroll and state outline were raised so that they could be ground and polished readily. For instructional purposes, some of the castings were given surface treatments of anodic oxidation, followed by dyeing the metal with a red die. Following the latter treatment, grinding and polishing of the flat surfaces brought out the natural aluminum color resulting in the school color combination—red and white.

Among some 400 industrialists from all parts of the state who visited the Engineering School's open house were many foundrymen. Particularly well represented were Milwaukee, West Allis, Racine and Beloit foundries.

A special feature of the day's program was the presentation of distinguished service citations to University of Wisconsin alumni who have proved outstanding in industry and in engineering fields. Among those so honored was William J. Grede of Grede Foundries, Inc., Milwaukee. A testimonial dinner attended by more than 150 persons preceded the citation presentation ceremonies.

(Below, left) University of Wisconsin FEF Students Ted Weins, left, and Gil Kempka, preparing the aluminum for pouring the University of Wisconsin Centennial souvenir plaques. The furnace shown is equipped with nitrogen flushing apparatus which is used for instruction of students in this phase of melting. Center, Gil Kempka is shown pouring the plaque molds. Right, FEF student Alvin Kasberg operates the Metal Casting Laboratory's jolt-squeeze molding machine using a matchplate on which eight patterns were mounted. The original pattern was carved by Metallurgical Engineering Senior Edwin Baugh.





Letters to the Editor

Nodular Cast Iron Increases Demand For All Castings

I heartily agree with Mr. Rehder (*"The Malleable Foundryman and Nodular Cast Iron,"* AMERICAN FOUNDRYMAN, April, 1949, page 111) that the development of nodular iron does not mean an end to the use of standard malleable iron. If we can trust past experience, development of a new material in this field will simply mean an increased demand for all types of cast components. A definite historical precedent for this viewpoint exists in that the development of malleable iron and steel resulted in an increased demand for the older cast material—gray iron.

I do differ with Mr. Rehder on a few points. My own experience is that if nodular irons are properly inoculated simultaneously or after the addition of the nodulizing alloy, the irons can be readily cast in thin sections. The irons are completely nodular in such thin sections and possess an entirely gray structure. In fact, it is in these thin sections that superior castability as opposed to the white base irons used in the malleable process may be a determining factor.

I also feel that it is too early to estimate the cost of the nodular iron process, and consequently to compare it with the cost of malleable iron.

C. O. BURGESS, *Technical Director*
Gray Iron Founders' Society, Inc.
Cleveland

A Foundry With A Future

We are a small gray iron jobbing foundry, in operation for some 30 years, and until about 10 years ago produced castings of hit-or-miss quality in a small shop.

About 10 years ago we attempted the production of some of the alloyed and specification cast irons. We soon realized that in order to produce controlled cast iron, it is necessary that it be controlled by individuals with technical background and experience—men capable of understanding the importance of closely watching details of techniques set up in melting, molding, sand control operations.

After the war, we put on a young metallurgical engineer right out of college, his first work for several months being in the laboratory running routine analyses. We have since employed several additional young graduates, starting them in the laboratory, then moving them to melting, sand control, etc., and several of them are now doing some sales work. We have no formal program, but through varied experiences we expect to develop a group of young, well-rounded foundrymen capable of carrying on our business as we older heads pass out of the picture.

We are rather positive in the thought that the gray iron jobbing foundries that build their organizations around young, technically trained men who realize that the production of castings has passed from an art to a science, will have the best chance of survival in the coming years.

E. A. THOMAS, *President*
Thomas Foundries, Inc.
Birmingham, Ala.

Many Patternmaking Methods Training Plans Outmoded?

From a patternmaker's point of view I am interested in and agree with views reported in AMERICAN FOUNDRYMAN on attempting to carry on a competitive business with heavy, clumsy, outmoded machinery. There is a need for more publicity about modern methods of patternmaking such as application of plastics. Standards could also be set for core-print sizes, draft, core-plate sizes for gang core boxes and flask sizes for match plates.

No two foundries will agree on gating methods but a standard could be set as a general guide for pattern shops which make match plates for customers without consulting the foundry doing the job.

I believe a loose-leaf book showing some of the "don'ts" for the patternmaker could save the foundry headaches and money. I would include such things as: putting a decent draw bar on large work instead of a fancy, flimsy rapping plate; proper methods of locking core prints to prevent shifting of cores; standards for close-over in the cope; and many others.

For the efficient construction of patterns to prevent shrinkage or warping, standards could be set for the guidance of the customer out shopping for patterns. Another valuable addition to such a book would be a section on new methods of laying out work, together with trigonometric tables, geometric functions, a shrinkage conversion chart and instructions on the use of the height gage, sine bar, etc.

Save Time With Mathematics

Many hours of labor are wasted in most pattern shops laying out work to get one or two dimensions that could be figured out by geometry or trigonometry.

The new crop of apprentices is indoctrinated by old timers who say the only way to learn the trade is the old way. Since the old timers got by without using mathematics they don't care to learn new tricks at this stage of the game. And there are many tricks that could be shared by all such as sharpening tools properly, mixing plaster correctly and using molding clay and Wood's metal casts for speedy duplication of patterns for match plates.

I liked the article in the April issue of AMERICAN FOUNDRYMAN, *"Cast Large Aluminum Wheel"* (page 133). Louis Schmidt put a lot of thought into this and engineered the job for the benefit of foundries.

Another interesting April article is *"Design Light Metal Castings,"* by George H. Found (p. 91). In discussing designers' problems, Mr. Found states that "cut and try methods are becoming obsolete." I believe this same statement can also apply to patterns for high production foundries.

Quite a number of our larger firms have pattern layout draftsmen who get together with the foundry and engineering departments to redesign castings that can be *made*. They set up molding methods and determine finish allowances, size of core prints, amount of draft and the like. This eliminates costly guess work and changes.

I look forward to more articles on the foundry's most important tool—patterns.

JOHN R. HOFFMAN
Muskegon, Mich.

Outline Supervisory Training

We are remedying our shortage of foundry supervisory personnel by putting college graduates through an 18 months training program.

Three of the six trainees who started with us are still on the program. One has taken a leave of absence to acquire another degree and the other two left for supervisory positions elsewhere.

Departments and number of days trainees spend in each are as follows:

DEPARTMENT	DAYS
Industrial Relations	11
Pattern Shop	17
Sand Control	40
Metallurgy	30
Cupola	30
Core Room	40
Molding	35
Mill Room	25
Foundry Inspection	30
Budget	2
Standards	15
Planning & Scheduling	21
Stores	10
Maintenance	25
Purchasing	3
Foundry Sales	4
Estimating	10
Cost Accounting	5

The trainees work eight hours a day, five days a week, making their 390 day training period 78 weeks long. We had hoped to shorten the schedule to one year but found this is not long enough to complete all the work we believe the trainees should have before becoming supervisors.

The trainees are allowed to stay in certain departments longer than scheduled, either through request of department supervisor, or through desire of the trainee to acquire more experience.

Oftentimes, the trainee is promoted to acting foreman and his ability to supervise is watched intently by top management.

Our recruitment has been done through personal contact with graduating students. The school placement office advertises our program to the students prior to our visit and all students interested are interviewed upon our visit.

F. L. VIDAL
Industrial Relations Director
Wilson Foundry & Machine Co.
Pontiac, Mich.

WHO'S WHO

J. W. Cable

J. Wesley Cable, author of *"Dielectric Core Baking,"* Page 99, is a consultant on high-frequency heating, and makes his headquarters in New York City . . . Graduated from Rensselear Polytechnic Institute in 1933 with a degree in Electrical Engineering, Mr. Cable was for several years employed by the Eastern New Jersey Power Co., and the Consolidated Edison Co. of New York as a draftsman and a research engineer . . . In 1941, Mr. Cable was appointed director of research for the Induction Heating Corp., Brooklyn, and last year resigned to become a high frequency heating consultant . . . Mr. Cable has been a frequent speaker before regional meetings of the American Foundrymen's Society on induction and dielectric heating and dielectric core baking . . . He is the author of *Induction Heating,* published in 1946, by the American Society for Metals, and is completing *Induction and Dielectric Heating,* to be published this year . . . He is a member of the Executive Committee of ASM.

D. C. Williams

Douglas C. Williams, author of *"Foundry-Option at Ohio State University,"* Page 106, is assistant professor, Department of Industrial Engineering, Ohio State University, where he is Faculty Advisor to the A.F.S. Student Chapter . . . Dr. Williams, a former A.F.S. Research Fellow at Cornell University, has for several years been active in promoting foundry educational work at the college level . . . A graduate of Beloit College, Beloit, Wis., Dr. Williams served successively as chemist for E. I. DuPont de Nemours Co., Wilmington, Del.; chemist with the J. R. Short Milling Co, Chicago; heating and air conditioning engineer with the Delco-Frigidaire Division of General Motors Corp.; and as chemical engineer in the Research Laboratory of American Steel Foundries, East Chicago, Ind. . . . Following this, Dr. Williams received his appointment as A.F.S. Research Fellow at Cornell University, where he received his M.S. and Ph. D. degrees . . . He was appointed assistant professor in the Department of Industrial Engineering of Ohio State University in 1948, and was instrumental in the formation of the A.F.S. Student Chapter there.

R. W. Bennett

Roy W. Bennett, author of *"Wet System Reclaims Foundry Sand,"* Page 58, is foundry engineer for the Hydro-Blast Corp., Chicago . . . A native of Indiana, Mr. Bennett served his apprenticeship at American Steel Foundries, East Chicago, Ind., while taking extension courses from the University of Indiana and Purdue University . . . In 1941 Mr. Bennett joined the Harry W. Dietert Co. Detroit, as a sand technician, and in 1944 became sales manager for the Metronite Co, Milwaukee . . . Mr. Bennett was appointed to his present position as foundry engineer for the Hydroblast Corp. in 1947 . . . Mr. Bennett has been co-author of several technical papers on mold surface properties.

S. C. Massari

S. C. Massari, author of *"Graphitizing Behavior of White Iron,"* Page 67, is Technical Director of the American Foundrymen's Society and was recipient of the A.F.S. John H. Whiting Gold Medal at the 53rd A.F.S. Convention this month in St. Louis "for outstanding contributions in the field of ferrous metallurgy, molding and foundry practice and service to the wartime foundry industry with the Chicago Ordnance District." . . . Graduating from the Massachusetts Institute of Technology in 1924 with a B.S. in Metallurgy, Mr. Massari became director of research of the Illinois Zinc Co., Peru, Ill., the following year . . . In 1926, Mr. Massari was appointed chief metallurgist in charge of research for the Association of Chilled Car Wheel Manufacturers . . . Entering the Army in 1942 as a Captain, he was placed in charge of armor production and facility expansions for the Chicago Ordnance District . . . At the end of World War II, he was released from active duty as a Lieutenant Colonel and for his work as Assistant Chief of the District's Tank Automotive Branch was awarded the Legion of Merit . . . Mr. Massari became Technical Director of A.F.S. in 1946.

V. J. Sedlon

Vincent J. Sedlon, author of *"High Production Patterns,"* Page 54, was elected a National Director of the American Foundrymen's Society at the 53rd A.F.S. Convention, held this month in St. Louis . . . Associated with the foundry pattern industry for 30 years, Mr. Sedlon has long been active in the A.F.S. Pattern Division, of which he is a past chairman . . . Author of several papers on patternmaking in the technical press, Mr. Sedlon is president of the Master Pattern Co., Cleveland.

E. L. Stromberg

Elerov L. Stromberg, author of *"Preselecting Foundry Employees,"* Page 63, is professor of Psycology at Cleveland College of Western Reserve University . . . An authority on industrial psychology and personnel problems, Dr. Stromberg is widely known as an author and speaker on those subjects . . . A native of Nebraska, Dr. Stromberg holds an A.B. from Nebraska Wesleyan University, an M. A. from the University of Oregon, and a Ph. D. from the University of Minnesota . . . Appointed assistant professor at Oklahoma A & M College in 1937, Dr. Stromberg left there five years later to accept a commission as a Lieutenant Commander, USNR, specializing in Aviation Psychology, during World War II . . . At war's end he joined the firm of Stevens, Jordan and Harrison, Chicago, as an industrial psychologist, and in 1946 was appointed professor of Psychology at Cleveland College of Western Reserve University, his present position . . . A member of the staff of the Personnel Research Institute, Cleveland, Dr. Stromberg has served in an advisory capacity to several technical organizations. The grandson of a Swedish molder, Dr. Stromberg has more than a casual interest in the problems of the foundry industry.

Chapter Meetings

MAY 16

CHICAGO

Chicago Bar Association
ROUND TABLE MEETINGS

ELMER ZIRZOW
Deere & Co.
"The Importance of Sand Control"

W. T. WALWORTH
Lumbermen's Mutual Casualty Co.
"Industrial Hygiene in the Foundry"

L. D. PRIDMORE
International Molding Machine Co.
"Core Blowing"

Non-Ferrous Round Table: *"Precision Castings"*

QUAD CITY

Fort Armstrong Hotel, Rock Island, Ill.
H. J. JACOBSON
Industrial Pattern Works
"Core Box Design and Rigging for Core Blowing"

MAY 17

ROCHESTER

Barnard's Exempt Firemen's Association
A. W. GREGG
Whiting Corp.
"Foreman Training—Cooperation with Technical Schools"

EASTERN NEW YORK

Circle Inn, Latham's Corners
OSCAR CARLSON
Carlson Pattern Co.
Subject to be announced.
ANNUAL ELECTION OF OFFICERS

CENTRAL MICHIGAN

American Legion Club, Battle Creek
F. G. STEINEBACH
Penton Publishing Co.
"What's Ahead in the Foundry Industry"

MAY 19

CHESAPEAKE

Washington, D. C., Navy Yard (during day), and Dodge Hotel, Washington, D. C. (evening)
GEORGE K. DREHER
Foundry Educational Foundation
"Why, What and How of a Graduate Engineer"

MAY 20

DETROIT

Rackham Memorial Bldg., Detroit
RALPH L. LEE
General Motors Corp.
"Humanics"
Motion Picture: *"Curiosity Shop"*
FATHER AND SON NIGHT

BIRMINGHAM DISTRICT

Tutwiler Hotel, Birmingham
CLYDE A. SANDERS
American Colloid Co.
"Foundry Sand Practice"

WASHINGTON

Hotel Tacoma, Tacoma
STANLEY MARSHALL
Atlas Foundry & Machine Co.
"Proper Treatment of Molding Sand"

TEXAS

Texas State Hotel, Houston
ANNUAL BUSINESS MEETING AND ELECTION OF OFFICERS

MAY 23

NORTHWESTERN PENNSYLVANIA

Moose Club, Erie
A. LESLEY GARDNER
"Abrasive Cleaning"
JOSEPH GAUSS
"Fighting Through Germany With an Armored Division"

TWIN CITY

Covered Wagon, Minneapolis
GLEN MERREFIELD
Giffels & Vallet, Inc.
"Mechanization for Small Foundries"

JUNE 4

N. ILLINOIS — S. WISCONSIN

Beloit Country Club, Beloit, Wis.
ANNUAL PICNIC

SAGINAW VALLEY

Potter's Lake, Mich.
ANNUAL SUMMER OUTING

JUNE 7

CINCINNATI DISTRICT

Summit Hills Golf Club, Cincinnati
ANNUAL PICNIC AND STAG OUTING

JUNE 10

CENTRAL NEW YORK

Mountain Top Grove, Binghamton
ANNUAL BUSINESS MEETING AND PICNIC

JUNE 11

CENTRAL ILLINOIS

ANNUAL STAG PICNIC

A. F. S. Employment Service

To contact firms seeking personnel through "Help Wanted" items write to American Foundrymen's Society, 222 West Adams St., Chicago 6, designating Item Number and issue of AMERICAN FOUNDRYMAN in which published. A.F.S. Applicant Registration Form then will be sent to applicant for filling in and returning to A.F.S. Headquarters. The form will be sent by Headquarters to the firm and all negotiations thereafter must be made between applicant and firm.

Firms desiring to contact applicants should write A.F.S. Headquarters on firm letterhead, designating Item Number and issue.

POSITIONS WANTED

PW112—Metallurgist: Prefer production control or research position in steel or iron foundry, east or midwest. Chief metallurgist for steel foundry, 2 years; general foundry research for industrial research organization, 2½ years; technical control and trouble shooting metallurgist for large tool firm, 3 years. Presently employed, married, 2 children. Age 30, graduated 1941.

PW113—Foundry Master Mechanic: Over 30 years experience in modern foundry. Specialist in sand handling systems; can take complete charge of foundry maintenance. Will take position with foundry equipment company supervising construction, installation and field work. Supervised men past 25 years. Background: tool maker, technical and engineering schools. Employed now; can give good references.

PW114—Pattern Shop Foreman: Six years on supervision, 20 years as wood patternmaker, pattern layout draftsman, foundry planning for production and jobbing on aircraft, automotive, machine tool and all-around pattern work. Some foundry supervision as general foreman in magnesium foundry. Available now; location unimportant.

PW115—Foreman or Superintendent: Sixteen years as molder, molding foreman, general foundry foreman; mostly in gray iron on stove plate, furnace castings, light jobbing. Some molding experience in steel and aluminum. Good practical background and fair technical knowledge with experience in gating, risering, sand control, cupola operation and production scheduling. Can supervise all foundry operations. Age 33, married.

FOUNDRY *Personalities*

John Paul Ahern has been named Executive Director, and **Edward E. Fries** Field Secretary of the National Foundry Association, according to a recent announcement by Franklin Farrell III, Association President. Mr. Ahern, a graduate of Yale University, has a broad background as a

J. P. Ahern

member of the Executive Staff of the Manufacturers Association of Connecticut. He will direct promotional activities and expand the services of the National Foundry Association. Mr. Fries has for several years been on the Administrative staff of the Association and will be responsible for energizing the development of foundry management activities in the nine regional districts of the Association.

Andre L. Mechelynck, a graduate of Belgium's Universities of Liege and Brussels, and the University of Pittsburgh, recently joined the engineering staff of the Belgian Division of the American Radiator & Standard Sanitary Corp., Vilvorde, Belgium. Mr. Mechelynck has just completed a six months' training period in the United States offices, and plants of American Radiator & Sanitary Corp.

Boyd Hays, formerly superintendent of the Union Malleable Iron Works plant of Deere & Co., Moline, Ill., has been appointed manager. Mr. Hays, who began his career as a coremaker with the Keokuk Steel Casting Co., Keokuk, Iowa, has been, successively, molder, foreman, general foreman, assistant superintendent and superintendent at Union Malleable Iron Works, prior to his new appointment.

Henry Wardwell, II, has been elected assistant to the president of Burnside Steel Foundry Co., Chicago. Mr. Wardwell, who started with the company in 1934, was elected a director in 1936, and in 1941 entered the Navy as an aviator. He was discharged in September, 1945, with the rank of Lieutenant.

J. B. Neiman has announced his resignation as of June 1 as general manager of the General Aluminum department of the Federated Metals Division, American Smelting & Refining Co. Mr. Neiman has been president of the Aluminum Research Institute for the last eight years. He has been with Federated Metals and its predecessor companies since 1911, serving in various executive capacities. During the war, Mr. Neiman served on the War Production Board and was active in several other Governmental agencies. He will continue to make his headquarters at 729 Fisher Bldg., Detroit, until further notice.

E. E. Fries

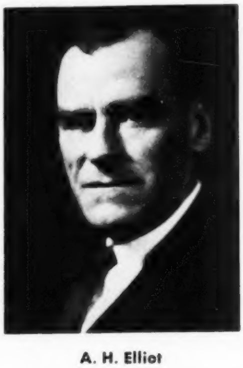
Charles F. Roland, instructor in Foundry Practice at Lane Technical High School, Chicago, announces the establishment of a consulting service for estimating weights of castings. Mr. Roland will make his headquarters at 215 Forest Drive, Itasca, Ill. He was formerly sales engineer for American Steel Foundries, Chicago, and sales representative for the McCarthy Foundry Co., Chicago.

James E. Ziegeler has been appointed a member of the sales engineering force of the Cooper Alloy Foundry Co., Hillside, N. J. A graduate of Purdue University's School of Metallurgical Engineering, Mr. Ziegeler recently completed an intensive, in-service training course at Cooper Alloy.

E. F. Thum, Jr., formerly vice-president and general manager of the Abrasive Alloy Castings Co., Bridgeboro, N. J., was elected president of the company at a February meeting of the Board of Directors.

Robert J. Young, formerly plant superintendent for Sterling Alloys, Inc., Noburn, Mass., was recently appointed steel foundry superintendent for the Dominion Engineering Works, Ltd., Montreal, Que., Canada. A graduate of Lehigh University with a degree in Chemical Engineering in 1913, Mr. Young has held supervisory positions as chemist, metallurgist, electric furnace melter, and foundry superintendent in several large foundries in the East and New England states.

August H. Elliot, vice-president of Southern Wheel Division of the American Brake Shoe Co., recently retired after 40 years of service with the company. Mr. Elliot became vice-president of Southern Wheel in 1927, and had charge of engineering and operations there for many years. Mr. Elliot established the company's Wheel Inspection Department, which was later taken over by the Association of Manufacturers of Chilled Car Wheels, and played a leading role in developing the present chilled car wheel. A graduate of Yale University,



A. H. Elliot

Mr. Elliot served as a Captain in the Corps of Engineers in World War I as chief materiel officer for the Mechanical Department of the Army Transportation Corps.

Several changes in district sales office personnel for the Carborundum Co., Niagara Falls, N. Y. are: **F. H. Appenrodt**, Pittsburgh District Sales Office manager, has resigned and will be succeeded by **H. P. Erbe**, formerly Cleveland manager; **R. L. Heinstadt**, assistant office manager at Detroit, to be Cleveland manager; **D. S. Masson**, manager of Sales Administration at the Company's home office, will become assistant to the Detroit District sales manager. **J. R. Middleton** will continue as Detroit office manager.

Fred G. Kramer has been appointed sales manager and technical advisor for the American Silica Sand Co., Ottawa, Ill., succeeding **Arthur S. Hindman,** vice-president and sales manager, who retired April 30.

Robert B. Douglas, president of Godscroft Industries, Ltd., Montreal, Que., recently was elected the first Canadian president of the American Society of Tool Engineers. Other officers elected were: **Herbert L. Tigges,** Baker Bros., Inc., Toledo, Ohio, first vice-president; **J. J. Demuth,** Siligo Iron Stove Co., St. Louis, second vice-president; **Halsey F. Owen,** Industrial Engineering Dept., Purdue University, third vice-president; **W. B. McClellan,** Gairing Tool Co., Detroit, secretary; and **G. A. Goodwin,** Master Electric Co., Dayton, Ohio, treasurer. New members named to the Board of Directors are: **L. B. Bellamy,** Sterling Grinding Wheel Co., Detroit; **V. H. Ericson,** Johnson de Vou, Inc., Worcester, Mass.; **Art Lewis,** Art Lewis Production Equipment Co., Glendale, Calif.; and **Roger Waindle,** Elgin National Watch Co., Elgin, Ill.

William D. Manly, formerly research assistant at Battelle Memorial Institute and the University of Notre Dame, has been appointed metallurgist for the Oak Ridge National Laboratory, Oak Ridge, Tenn. Mr. Manly holds a B.S. and an M.S. from the University of Notre Dame.

James Thomas Gow, Sr., formerly supervising metallurgist in charge Industrial Metallurgical Research at Battelle Memorial Institute, has been appointed chief metallurgist for the Electric Steel Foundry Co., Portland, Ore. Mr. Gow, who has attended the University of Minnesota, Purdue University and New York University, has been active in metallurgical research both in industry and in education, and is a prolific writer on the subject of physical metallurgy for the technical press. Mr. Gow has spoken before meetings of A.F.S. and other technical societies.

Paul H. Anderson, recently was awarded an M.S. degree from the University of Minnesota in Metallography. Mr. Anderson, whose thesis was on "*Hot Dip Tinning of Low Carbon Steels—A Consideration of the Effect of Cold Working Upon the Tinning Properties of Steel,*" intends to remain at the University of Minnesota to work towards a Ph. D. degree.

J. A. Pennell, assistant works manager of the Brantford plant of the Canadian Car & Foundry Co., has been appointed works manager, succeeding the late A. Ashton. Mr. Pennell started with the company 37 years ago as a junior stockroom clerk, later served a complete apprenticeship in the pattern shop, where he was appointed foreman in 1928. Mr. Pennell was appointed plant superintendent in 1945, and early this year was made assistant works manager.

George D. Cobaugh has been named St. Louis district manager of the Harbison-Walker Refractories Co., succeeding **Frank Weir,** newly-appointed Pittsburgh district

(Continued on Page 146)

A. F. S. CHAPTER DIRECTORY

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BIRMINGHAM DISTRICT CHAPTER
Secretary-Treasurer, F. K. Brown, Adams, Rowe & Norman, Inc.
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Secretary-Treasurer, L. P. Young, A-1 Steel & Iron Foundry Ltd.
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Secretary-Treasurer, W. B. Coleman, W. B. Coleman & Co.
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Secretary-Treasurer, C. R. Marthens, Marthens Co.
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Secretary-Treasurer, L. C. Kimpal, Rochester Gas & Electric Corp.
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Secretary, J. E. Wilson, Climax Molybdenum Co.
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Secretary-Treasurer, Herman Bohr, Jr., Robbins & Bohr.
TEXAS CHAPTER
Secretary-Treasurer, P. B. Croom, Houston Pattern Works
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TRI-STATE CHAPTER
Secretary, D. A. Mitchell, Progressive Brass Mfg. Co.
TWIN CITY CHAPTER
Secretary-Treasurer, L. K. Polzin, Minneapolis Chamber of Commerce
WASHINGTON CHAPTER
Secretary-Treasurer, Fred R. Young, E. A. Wilcox Co.
WESTERN MICHIGAN CHAPTER
Secretary, S. H. Davis, Campbell, Wyant & Cannon Fdry.
WESTERN NEW YORK CHAPTER
Secretary, R. E. Walsh, Hickman, Williams & Co.
WISCONSIN CHAPTER
Secretary, W. W. Edens, Badger Brass & Aluminum Fdry. Co.

STUDENT CHAPTERS

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MISSOURI SCHOOL OF MINES
Secretary, Martin L. Slawsky
OHIO STATE UNIVERSITY
Secretary-Treasurer, Arthur Stoner
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Secretary-Treasurer, Robert N. Randall
OREGON STATE COLLEGE
Secretary, John P. Meece
UNIVERSITY OF ILLINOIS
Secretary, Robert W. Bales
TEXAS A & M COLLEGE
Secretary, Victor C. Henkel.

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Schenectady, N. Y.
Chairman
Eastern New York Chapter

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Dayton Oil Co.
Syracuse
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E. D. Shomaker
Kay-Brunner Steel Products, Inc.
Alhambra, Calif.
Vice-President
Southern California Chapter

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Buffalo
Director
Western New York Chapter

C. L. Lane
Florence Pipe Fdry. & Machine Co.
Florence, N. J.
Chairman
Philadelphia Chapter

New AFS MEMBERS

Period March 15—April 15: New A.F.S. members for the third period of 1949 number 125, including seven new company members. The Northeastern Ohio Chapter, with 13 new members, again had the greatest period gain. Among the student chapters, Massachusetts Institute of Technology led wih eight of the 13 new student members.

NEW COMPANY MEMBERS

Steel Grit of Canada Ltd., L'Assomption, Que., Canada—Raoul Bardet, Gen. Mgr. (Eastern Canada & Newfoundland Chapter).

Apex Smelting Co., Cleveland, Ohio—Robert K. Beck (Northeastern Ohio Chapter).

McVoy-Hausman Co., Birmingham, Ala.—F. Albert Hausman, Owner (Birmingham Chapter).

Girdler Corp., Thermex Div., Louisville Ky.—Boyd R. Hopkins, Sls. Mgr. (Cincinnati Chapter).

Az. Ind. Vittorio Necchi, Pavia, Italy.

Roloff Manufacturing Corp., Kaukauna, Wis.,—W. H. Roloff, Pres. & Gen. Mgr. (Wisconsin Chapter).

McDonough Foundry & Machine Co., McDonough, Ga.—J. L. Sinback, Pres.

BIRMINGHAM CHAPTER

McVoy-Hausman Co., Birmingham, Ala. (F. Albert Hausman, Owner).
Max L. Kimerling, Pres., M. Kimerling & Sons, Inc., Birmingham, Ala.

CENTRAL ILLINOIS CHAPTER

William C. Clark, Molder & Lab. Tech., University of Illinois, Urbana, Ill.
John C. Schwartz, Pattn. Maker, Precision Pattern Works, Peoria, Ill.
Norman F. Tisdale, Chf. Met. Engr., Molybdenum Corp. of America, Pittsburgh, Pa.
Loren G. Zuercher, Pattn. Layout Man, Caterpillar Tractor Co., E. Peoria, Ill.

CENTRAL MICHIGAN

Robert D. Dodge, Sls. Repr., Werner G. Smith Co., Detroit.
Donald I. Huizenga, Student, Michigan State College, E. Lansing, Mich.

CENTRAL NEW YORK

Wm. R. Anderson, Factory Repr., Master Pneumatic Tool Co., Inc., Syracuse, N. Y.
Lewis A. Balduzzi, Fmn., Oberdorfer Foundries, Inc., Syracuse, N. Y.
D. L. Smith, Mgr., Pattern Maker's, Inc., Syracuse, N. Y.

CENTRAL OHIO CHAPTER

Phil Thuma, Fdy. Fmn., Foster Stove Repair Co., Ironton, Ohio.

CHESAPEAKE CHAPTER

Auzville Jackson, Jr., Student, Virginia Polytechnic Inst., Blacksburg, Va.
Richard I. McLaren, Factory Repr., Master Pneumatic Tool Co., Inc., Baltimore, Md.

CHICAGO CHAPTER

Fred G. Koenig, Link-Belt Company, Chicago.
Albert A. Milkie, Sls. Engr., Robins Conveyors Div., Hewitt Robins Inc., Chicago.
Mitchell Silverstein, Met., Silverstein & Pinsof, Inc., Chicago.
Robert R. Stoffer, Sls. Engr., United States Rubber Co., Chicago.
J. Walter Wallace, Repr., American Brake Shoe Co., National Bearing Div., Chicago.
Stanley Wozniak, Fmn., Hansell-Elcock Co., Chicago.

CINCINNATI CHAPTER

Girdler Corp., Thermex Div., Louisville, Ky. (Boyd R. Hopkins, Sls. Mgr.).
Julian W. Nuss, Fdy. Engr., American Radiator & Standard Sanitary Corp., Louisville.
C. D. Rissell, Factory Repr., Master Pneumatic Tool Co., Inc., Cleveland.

DETROIT CHAPTER

David R. Bair, Sls. Engr., Pangborn Corp., Detroit.
George Calvin Evans, Student—Maint., University of Mich. (Fdy. Lab.) Ann Arbor, Michigan.
Elmer W. Gerhard, Jr., Gorham Tool Co., Detroit.
Edward F. Paulus, Factory Repr., Master Pneumatic Tool Co., Inc., Detroit.
Raymond W. Thomas, Chemist, Kolene Corp., Detroit.

EASTERN CANADA AND NEWFOUNDLAND CHAPTER

Steel Grit of Canada Ltd., L'Assomption, Que., Canada, (Raoul Bardet, Gen. Mgr.).
Owen R. Congdon, Mech. Supt., Warden King Ltd., Montreal, Que.
Thomas Pracher, Patternmaker, Gurney Foundry Co., Ltd., St. Laurent, Que., Canada.

METROPOLITAN CHAPTER

J. Wesley Cable, Conslt. Engr., New York.
John C. Beers, Operating Appr., American Brake Shoe Co., Mahwah, N. J.
Robert M. Cornelius, Sls. Engr., United States Rubber Co., New York.
Robert Hempel, Fmn., The Cooper Alloy Foundry Co., Hillside, N. J.
Glenn W. Mehltretter, Supt., Inv. Castg. Dept., The International Nickel Co., Bayonne, N. J.
John Tyler Dominick Rich, Special Appr., American Brake Shoe Co., Mahwah, N. J.
Henry F. J. Skarbek, Plt. Mgr., American Aluminum Casting Co., Irvington, N. J.
Richard C. Smith, Appr., Eastern Malleable Iron Co., Naugatuck, Conn.
Frank Tosa, Jr., Special Appr., American Brake Shoe Co., Mahwah, N. J.

MEXICO CITY CHAPTER

Francisco Saravia, Jr., Mexico City, D. F., Mexico.

NORTHEASTERN OHIO CHAPTER

James V. Anthony, Statistics Computer, National Malleable & Steel Cstgs. Co., Cleveland.
Apex Smelting Co., Cleveland (Robert K. Beck).
Henry A. Betts, Master Pneumatic Tool Co., Inc., Cleveland.
John R. Clague, Factory Repr., Master Pneumatic Tool Co., Inc., Cleveland.
Ted Durdon, Fmn., National Malleable & Steel Cstgs. Co., Cleveland.
Reider Eriksen, Res. Met., National Malleable & Steel Cstgs. Co., Cleveland.
William L. Griffith, Student, Case Institute of Technology, Cleveland.
Robert Haas, Motion & Time Anal., National Malleable & Steel Cstgs. Co., Cleveland.
Fred William Maurin, Slsmn., American Crucible Co., Lakewood, Ohio.
J. W. Rooks, Jr., Sls. & Service, The C. O. Bartlett & Snow Co., Cleveland.
Edmund W. Walker, Chemist, National Malleable & Steel Cstgs. Co., Cleveland.
Paul Yohe, Time & Motion Analyst, National Malleable & Steel Cstgs. Co., Cleveland.
Ed. Ziska, Pattn. Shop Fmn., National Malleable Cstgs. Co., Cleveland.

NORTHERN CALIFORNIA CHAPTER

Jack D. Ramsdell, Student, University of California, Berkeley, California.

NORTHERN ILLINOIS & SO. WISCONSIN CHAPTER

Alexander C. Garstecki, Fdy. Appr., Fairbanks, Morse & Co., Beloit, Wis.

ONTARIO CHAPTER

Frank M. Hopper, Forest Foundry, Forest, Ontario, Canada.
Thomas W. Myatt, Partner, Toronto Pattern Wrks., Toronto, Ontario.

OREGON CHAPTER

James W. Smith, Instr., Industrial Engrg. Dept., Oregon State College, Corvallis, Ore.

PHILADELPHIA CHAPTER

Erle J. Hubbard, Fdy. Mgr., Janney Cylinder Co., Philadelphia, Pa.

QUAD CITY CHAPTER

James J. McConville, Fdy. Met., John Deere Waterloo Tractor Wks., Waterloo, Iowa.

ROCHESTER CHAPTER

Thomas Boyd, Pro. Mgr., Medina Iron & Brass Co., Medina, N. Y.

SAGINAW VALLEY CHAPTER

W. L. Douglas, Fmn., General Foundry & Mfg. Co., Flint, Mich.
Roy W. Foster, Asst. Gen. Mgr., Bay City Foundry Co., Bay City, Mich.
Sam W. Healy, Asst. to G. M., Central Foundry Div., General Motors Corp., Saginaw, Mich.
Donald K. Martens, Student, General Motors Institute, Flint, Mich.
Don S. Mills, Student, General Motors Institute, Flint, Mich.
Sam Mills, Jr., Student, General Motors Institute, Flint, Mich.
Noel G. West, Pattn. Supt., Buick Motor Div., General Motors Corp., Flint, Mich.

ST. LOUIS DISTRICT CHAPTER

James F. Gilbert, Pres., J. F. Gilbert Co. Inc., St. Louis, Mo.
N. P. Laconte, Dist. Mgr., Laclede-Christy Co., St. Louis, Mo.

TENNESSEE CHAPTER

George T. Foust, V. P., Fdy. Mgr., Clarksville Fdry. & Mach. Wks. Inc., Clarksville, Tenn.

TEXAS CHAPTER

John A. McAlister, Clean, Supv., Texas Electric Steel Casting Co., Houston, Texas.
John K. McGee, Prod. Devel. Engr., Texas Electric Steel Casting Co., Houston, Texas.
H. W. Palmer, Chief Insp., Texas Electric Steel Casting Co., Houston.

TIMBERLINE

William Schlegel, C/R Fmn., Western Foundry, Denver, Colo.

TRI-STATE CHAPTER

Rex A. Hill, Fdy. Supt., Progressive Brass Mfg. Co., Tulsa, Okla.
Roger G. Williams, Engr., Cities Service Oil Co., Oklahoma City, Okla.

TWIN CITY CHAPTER

Edward G. Kosanke, Patt. Maker, American Hoist & Derrick Co., St. Paul.
Elmer J. Kreger, American Hoist & Derrick Co., St. Paul.
Adam Roehl, Mpls.-Moline Power Implement Co., Hopkins, Minn.

WESTERN MICHIGAN CHAPTER

Daniel M. Anderson, Plt. Met., Bohm Aluminum & Brass Corp., South Haven, Mich.
Walter MacAnderson, Melter, Centrifugal Foundry Co., Muskegon, Mich.

WESTERN NEW YORK

Allan Johnson, Sand Analyst, American Radiator & Standard Sanitary Corp., Buffalo.
George A. Koch, Dist. Mgr., Robins Conveyor Div., Hewitt Robins Inc., Passaic, N. J.
Charles E. Kratzat, Stu. Fmn., American Radiator & Standard Sanitary Corp., Buffalo.
Robert E. Scott, Slsmn., Swan Finch Oil Corp., Jamestown, N. Y.
Charles C. Young, Slsmn., K. & L. Refractory Service, Erie, Pa.

WISCONSIN CHAPTER

Leon H. Hosch, Fdy. Supt., Lansing Co., Inc., Lansing, Iowa.
Alvin F. Kunz, Factory Repr., Master Pneumatic Tool Co., Inc., Hartland, Wisc.
James B. Kurtzweil, Student, International Harvester Co., Milwaukee.
Roloff Manufacturing Corp., Kaukauna, Wis. (W. H. Roloff, Pres. & Gen. Mgr.).
John R. Schoen, Asst. Engr., Fdy. Maint., Allis Chalmers Mfg. Co., Milwaukee.

STUDENT CHAPTERS

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Edward C. Clark
Joseph M. Harlan
George Howard Redington McQueen
Lee S. Richardson
John B. Stevens
Allen I. Swartz
William Dean Walther
Fred E. Werner, Jr.

OHIO STATE UNIVERSITY

James J. Pirrung
Arthur N. Saulino

TEXAS A & M COLLEGE

James H. Eaton
Robert Louis Jones
H. R. Noble

OUTSIDE OF CHAPTER

J. T. Clayton, Owner, Clayton Foundry & Siren Co., Daytona Beach, Florida.
George Ellis, Supt., Kaulback's Grey Iron Foundry, Laconia, N. H.
George W. Eppler, Asst. Gen. Mgr., Combustion Engrg. Superheater Co., Monongahela, Pa.
David Levinson, Met., Arcade Malleable Iron Co., Worcester, Mass.
J. L. Sinback, Pres., Donough Foundry & Machine Co., McDonough, Ga.

Belgium

Marcel J. Borgerhoff, Mining Engr., S. A. Fonderies J. Marechal-Ketig et Cie, Liege, Belgium.

England

Austin Sidney Beech, Chairman-Mgng. Dir., Foundry Equipment Ltd., Bedfordshire, England.
The British Aluminum Co., Ltd., Intelligence Dept., London E. C., England.
John Currie, Dir. & Gen. Mgr., Blackett, Hutton & Co. Ltd., Guisborough, Yorks, England.
Kenneth Docksey, Works Mgr., Parker Foundry Ltd., 'Tropenas' Steel Works, Derby, England.
Peter Claud Robinson, Met., Lake & Elliot Ltd., Braintree, Essex, England.
Norman Ryder, Managing Dir., Ryder Brothers Ltd., Beehive Steel Foundry, Bolton, Lancs., England.

France

John Jauberty, Ingenieur en chef, Usines Metallurgiques de Marquise, Rinxent (pdc) France.
Jacques J. G. Neuville, Mining Engr., St. Francaise des Cylinders de Laminois, Berlaimont (Nord), France.

Italy

Az. Ind. Vittorio Necchi, Pavia, Italy.

Scotland

John G. Wilson, Managing Dir., Carntyne Steel Casting Co., Ltd., Renfrenshire, Scotland.

Wales

R. J. Richardson, Stl. Fdy. Mgr., Brown Lenox & Co. Ltd., Wales.

Ohio State University To Reprint AF Articles On Quality Control

THREE ARTICLES ON FOUNDRY CONTROL AND COSTS, appearing in recent issues of AMERICAN FOUNDRYMAN, and in the 1948 A.F.S. TRANSACTIONS are being reprinted by Ohio State University for distribution to students in its Statistical Quality Control course.

The three articles selected by the University are: "*Quality Control Methods Brought Down to Earth,*" by Irving W. Burr, associate professor of Mathematics, Purdue University, AMERICAN FOUNDRYMAN, December, 1948, pages 43-47.

"*Creating Cost Consciousness,*" by Frank Wallace, principal, McKinsey & Co., Chicago, AMERICAN FOUNDRYMAN, December, 1948, pages 48-49.

"*Statistical Quality Control — A New Tool for the Foundryman,*" by H. H. Johnson and G. A. Fisher, National Malleable & Steel Castings Co., Sharon, Pa., A.F.S. TRANSACTIONS, Vol. 56, 1948, pages 194-207.

CHAPTER ACTIVITIES NEWS

Mo-Kan

Thomas Shadwick
Witte Engine Works
Chapter Reporter

A.F.S. National President W. B. Wallis and John Demler and Theodore Redin of the Demler Core Blowing Machine Mfg. Co., were guests of honor at the first meeting of the Mo-Kan Chapter following its official installation. The meeting, held at Rockhurst College, Kansas City, Mo., April 12, was attended by 58 members and their guests, including two new members added in April, bringing the Chapter membership to 51.

The new members are J. Emmett Morgan, Enterprise Foundry Co., Kansas City, Mo., and K. S. Patton, of the Mexico Refractories Co., Mexico, Mo.

President Wallis delivered an encouraging address to the Chapter on *"The Future of the Foundry Business,"* in which he stated that the industry's business recession in the last year can be overcome by current research into the production of better castings, and by an increase in overseas casting shipments due to the Marshall plan.

Theodore Redin of the Demler Core Blowing Machine Mfg. Co., was the evening's technical speaker. In his address on *"Core Blowers, Set-Ups and Core Blowing,"* Mr. Redin outlined the uses and advantages of core blowers. He told how costs can be cut through a speed-up in operations, proper uses of sands, and correct placement of wires and vents. Mr. Redin concluded with a resume of factors to be considered in the selection of coreblowers, installation and maintenance equipment.

In the Board of Directors meeting following the technical session, Chapter Chairman J. T. Westwood, Blue Valley Foundry Co., Kansas City, Mo., received progress reports on committee activities from the respective committee chairmen of the Chapter.

Plans for enlargement of the Chapter's membership are well under way. The Mo-Kan Chapter is just getting started and much interest is being shown on the part of members in making Mo-Kan one of the most active A.F.S. Chapters. To date the Chapter's organizers have provided fine meeting places, excellent dinners have been served and the best possible programs, featuring outstanding men of the industry, have been arranged.

Western Michigan Chapter Officers and speaker at the April 11 meeting at the Cottage Inn, Muskegon, Michigan, are left to right; seated: R. H. Herbst, West Michigan Steel Foundry Co.; C. H. Jacobson, Dake Engine Co., Chapter vice-chairman; Speaker H. M. St. John, Crane Co., Chicago; Chapter Chairman W. A. Hallberg, Lakey Foundry & Machine Co.; and W. Grant, Paul M. Wiener Foundry Co. Back row: S. H. Davis, Campbell, Wyant & Cannon Foundry Co., Chapter secretary; Charles Cousineau of the Lakey Foundry & Machine Co., F. Papke, Wolverine Brass Foundry Co.

Washington

Harold R. Wolfer
Puget Sound Naval Shipyard
Chapter Reporter

The March meeting was opened with reports on the Pattern and Molder Apprentice Contests. This was followed by a talk on "Labor Aiding Devices for the Small Foundry," given by William B. Ziegelmueller of the Electric Steel Casting Co., Indianapolis, who illustrated his talk with lantern slides showing what can be done to increase labor's efficiency and to improve working conditions in the foundry.

Dr. Alexander Finlayson of Pacific Car & Foundry Company, gave the main talk of the evening. His subject, *"The Diesel Engine Crankshaft,"* was fully illustrated by slides. He described the methods currently employed by his company for the production of cast iron crankshafts and discussed some of the unique engineering properties of the cast crankshaft which have recommended it to engine builders as having advantages over steel forgings.

Dr. Finlayson, who has devoted three years' research to the development of metallurgical and foundry techniques for the production of the cast iron crankshafts, stated that the idea of a casting substituting for a forging in a crankshaft was definitely established only by breaking down and disproving prejudicial and traditional thinking in this field. He attributes the success of this project to mathematical analysis, intensive survey, and experimentation.

He described the melting of this material in great detail. It is basically

steel with free graphite, a high test gray iron running 65 to 70,000 psi in tensile strength. It is melted in a basic electric arc furnace where the very closest control is maintained. Final properties of the casting are determined by an inoculation in the ladle.

A bottom pour ladle is used exclusively in pouring these castings. Some crankshafts require up to 4700 lb of metal to pour, he said.

Rochester

H. G. Stellwagen
Hetzler Foundries, Inc.
Publicity Chairman

MEETING MARCH 15 in the Palm Room of the Hotel Seneca, Rochester, the Rochester Chapter heard A.F.S. National Director Norman J. Dunbeck, Eastern Clay Products, Inc., Jackson, Ohio, and Mario Oliva, president of the Italian Foundrymen's Association.

Mr. Dunbeck enlightened the Chapter members as to the position of the National Office, financially and otherwise. He let the members know that the home office of the Society is doing everything possible to improve the organization and help the members.

Mr. Oliva as president of the Italian Foundrymen's Association is visiting America to see the U. S. foundry industry at work. He said that this is the first opportunity he has ever had to meet foundrymen of the United States and that he is very pleased with what he has seen and the men he has met. Mr. Oliva stated the Italian foundryman is putting up with terrible hardships and inconveniences in order to produce castings and went on to describe Italian foundry practices.

The principal speaker of the evening was William B. McFerrin of the Electro Metallurgical Co., whose topic was *"Castings Defects."* Mr. McFerrin described the various causes of castings defects and by means of lantern slides, showed how to correct these defects.

Mr. McFerrin stated that one of the principal causes of defective castings is improper pouring practice. Some 24 per cent of the defective castings made are due to this factor, he concluded.

Philadelphia

John L. Furey & A. J. Saute
Chapter Reporters

HELD AT THE ENGINEERS' CLUB, Philadelphia, the April 8 meeting of the Chapter was attended by some 165 members and their guests, who heard three speakers discuss the principles and applications of the products of their respective companies in a discussion on *"The Care of Foundry Equipment."* Walter S. Giele, Lebanon, Pa., foundry consultant, served as technical chairman of the meeting.

The speakers were:

G. B. Comfort, Schramm, Inc., West Chester, Pa., who spoke on *"Compressed Air and Air Compressors;"* R. Shire, Tabor Mfg. Co., who discussed *"Molding Machines;"* and A. L. Gardner, Pangborn Corp., who spoke on *"Cleaning Devices and Dust Control Equipment."*

Means of increasing the life of machines, reducing maintenance costs and improving operations were stressed in the discussions.

The March 11 meeting of the Chapter was held at the Franklin Institute, Philadelphia, and was attended by more than 300 members and their guests.

Following dinner, Cleveland P. Grant, lecturer and authority on bird life, presented a colored motion picture of big game in the Canadian Rockies. Mr. Cleveland followed this film with another on the life of the Rockies' big horn sheep—one of the most unusual wildlife motion pictures ever filmed.

L. A. Danse, General Motors Corp., acted as moderator for a discussion on preventive maintenance and plant modernization at the Detroit Chapter's March 17 meeting.

Chesapeake

Jack H. Schaum
National Bureau of Standards
Chapter Reporter

THE MARCH MEETING of the Chesapeake Chapter featured A.F.S. Gold Medalist Dr. Richard A. Flinn, American Brake Shoe Co., in a very instructive presentation on the subject of *"Heat Treatment of Gray Iron"*. In his talk Dr. Flinn emphasized that the metallographic structure is the primary guide to the properties of gray iron. This structure, originally determined during the solidification and cooling of the casting, can be altered by annealing, hardening, or stress relief heat

Twin City Chapter's March 3 meeting featured an address by R. A. Quadt (left), American Smelting & Refining Co., New York. Seated with Mr. Quadt at the speakers' table are (center) Chapter Chairman C. C. Hitchcock, R. C. Hitchcock & Sons, and Vice-Chairman F. A. Austin, Crown Iron Works.

treatments. Softening massive carbides requires at least 1600°F whereas martensite and fine carbide may be softened at 1200-1300°F.

The speaker described the use of the Jominy end-quench test for evaluating the hardenability of various grades of cast iron and showed slides of hardenability charts constructed from resulting data.

Examples were cited of castings, such as the chilled car wheel, where localized chilling and heat treatments were used to produce varied but optimum structures in different parts of the same casting. The interest of the audience was shown in the spirited discussion which followed the talk.

Saginaw Valley

K. H. Priestley
Vassar Electroloy Products, Inc.
Chapter Reporter

"NATIONAL OFFICER'S NIGHT", held March 3, began the Chapter's Annual Foundry Educational Series, and featured as its speaker W. B. Wallis, A.F.S. National President. Mr. Wallis spoke on *"The Foundry in Everyday Life."*

Following this, George K. Dreher of the Foundry Educational Foundation spoke briefly on *"Opportunities in the Foundry."*

Concluding the meeting was a discussion by Chapter Chairman O. E. Sundstedt, *"Foundrymen—Where They Come From and Types of Training Obtainable,"* presented in conjunction with a sound film on employment interviews and induction procedures.

The second meeting in the series was held March 10. *"Materials Used in the Foundry"* was the subject of a panel discussion led by Paul Van Amburg, General Foundry & Mfg. Co., Flint, Mich. Panel members were: Frank D. Haskins, General Motors Institute, Flint; Alfred E. Hilgeman, General Foundry & Mfg. Co., Flint; and K. H. Priestley, Vassar Electroloy Products, Inc., Vassar, Mich. After the discussion period, a motion picture was shown on modern foundry operations.

Third of the meetings was held March 17, and was divided into two parts—a motion picture on *"Old and New Foundry Practice,"* with N. J. Henke, Central Foundry Division, General Motors Corp., as discussion leader—and a series of slides on *"Cupola Practice,"* with Walter Bohm, Buick Motor Car Co., Flint, as discussion leader.

The final meeting of the Foundry Educational Series was held March 24 and opened with a showing of slides depicting *"The Producing of a Casting."*

The main event of the evening was a round table discussion, with E. L. Waterhouse, Eaton Mfg. Co., Vassar, representing management; James Bowen, Chevrolet Gray Iron Foundry, Saginaw, representing metallurgists; James H. Bernard, Eaton Mfg. Co., representing costs and purchasing; Morris C. Godwin, Bostick Foundry Co., Lapeer, representing production; and Harold Sieggreen, Central Foundry Division, General Motors Corp., representing pattern and rigging.

Held at the Emerson Junior High School Auditorium, Flint, the series was well attended by members and students of trade and high schools in the area.

Some 75 members and guests of the Western Michigan Chapter met at Muskegon's Cottage Inn April 11 to hear H. M. St. John, Crane Co., Chicago.

Michiana

S. F. Krzeszewski
American Wheelabrator & Equip. Corp.
Chapter Reporter

THE MARCH 1 MEETING of the Chapter, held at the Rumely Hotel, La Porte, Ind., was attended by 98 members and their guests, who heard Frank G. Steinebach, Penton Publishing Co., speak on *"What Is Ahead for the Foundry Industry."*

The speaker told of the great technological developments in the foundry field made during the war, and said that the industry must stabilize itself at a lower price level through wider distribution and greater use of technical development and mechanization, and better cooperation between labor and management.

William Ferrell, Auto Specialties Co., St. Joseph, introduced the speaker, and A. K. Nelson, Chicago Hardware Foundry Co., Elkhart, Ind., presided at the meeting, which concluded with the presentation of a list of nominees for 1949-50 Chapter officers.

Metropolitan

George Baer
Atlas Foundry Co.
Publicity Chairman

"ALUMINUM FOUNDRY PRACTICE" was the subject of the address given by R. A. Quadt, Federated Metals Division, American Smelting & Refining Co., to the members of the Metropolitan Chapter on March 7 at the Essex House, Newark, N. J.

He was introduced to the group by the technical chairman, Robert E. Ward, Eclipse-Pioneer Division of Bendix Aviation Corp., Teterboro, N. J. Mr. Quadt's talk revolved about an excellent collection of slides showing typical defects in aluminum castings, which were collected by Mr. Quadt over a period of years through his contacts with light metal foundries.

The slides were divided into three

sections, each dealing with defects encountered in a particular phase of foundry operations. The defects and means of eliminating them were discussed.

Under defects encountered in the melting process, Mr. Quadt showed examples of suspended flux in castings, suspended dross in castings, pinhole porosity due to gassing of metal, piping due to extremely high iron content, effect of pouring temperature on grain size and mechanical properties.

Mr. Quadt also discussed the design of tensile test bar molds and properties obtained through various designs and methods of handling.

In the next category, Mr. Quadt discussed defects due to improper transfer of metal from the furnace to the ladle and the molds. Most important is the effect of turbulence of the metal and the resulting entrapment of air and steam. Methods of overcoming this turbulence through careful transfer and proper gating were shown.

The final part of Mr. Quadt's talk dealt with defects due to improper molding. He showed numerous slides demonstrating the effect of poor gating and risering on aluminum castings, both sand and permanent mold.

Among these were castings with internal shrinkage due to insufficient risering, surface shrinkage due to improper ingating.

A very important phase of molding deals with permeability of sand venting of molds in order to eliminate air and water vapor as the mold is filled. Mr. Quadt emphasized that, due to aluminum's low density, it is most important to use sand of high permeability.

A question period followed Mr. Quadt's talk.

At the speakers' table at the March 18 meeting of the Tennessee Chapter were, seated, left to right: K. L. Landgrebe, The Wheland Co., Chapter vice-chairman; Speaker C. O. Bartlett, C. O. Bartlett & Snow Co., Cleveland, Ohio; Chairman G. Frank Anderson, Chattanooga Implement & Mfg. Co.; Prof. E. C. White, head of the Metallurgy department of the University of Alabama. Standing, left to right: Harry Griscom, The Wheland Co.; and George K. Dreher, Foundry Educational Foundation.

Tri-State

R. W. Trimble
Bethlehem Supply Co.
Chapter Director

Fifty members and guests attended the March 18 meeting at the Hotel Lassen, Wichita, Kan., to hear Ralph A. Clark, Electro Metallurgical Division, Union Carbide & Carbon Corp., Chicago, on "*Basic Principles of Cupola Operation.*"

Mr. Clark's knowledge of the subject made for an extremely interesting talk, which was followed by a discussion period.

The meeting concluded with the presentation of a list of Chapter officer and director nominees for the 1949-50 season.

Kenneth H. Priestley (right) of Vassar Electroloy Products, Inc., Vassar, Mich., sported a "beaver" to the April 7 meeting of the Saginaw Valley Chapter as an entrant in the Vassar Centennial Beard Contest.

Birmingham District

J. P. McClendon
Stockham Valves and Fittings
Publicity Chairman

Conditions in Europe were depicted by Lester B. Knight, Lester B. Knight & Associates, Inc., Chicago, at the March meeting of the Birmingham District Chapter.

According to Mr. Knight the Nationalization program is now about 95 per cent complete in Czechoslovakia. The few small independent industries left will soon be forced to close down entirely because they cannot continue to operate against great odds, and must join the program as a matter of self preservation.

These experiences were related at the dinner meeting, when Program

Chairman C. P. Caldwell, Caldwell Foundry & Machine Co., introduced Mr. Knight and asked him to tell about his recent trip to Europe.

Dr. James T. MacKenzie, American Cast Iron Pipe Co., Chapter Chairman, presided over the dinner and technical session. Much interest was shown in Mr. Knight's talk on *"Foundry Mechanization"* and several questions were asked.

Featured speaker at the March 11 meeting of the Wisconsin Chapter was DeWitt Emery, left, president, Milwaukee Small Businessmen's Association, shown here talking with Chairman R. E. Woodward, Bucyrus-Erie Co.

Eastern New York

John M. Jones
American Locomotive Co.
Publicity Chairman

THE MARCH 15 MEETING had as its featured speaker Clyde A. Sanders, American Colloid Co., Chicago, and was held at the Circle Inn, Lathams Corners, N. Y.

Mr. Sanders spoke on the *"Care and Handling of Sand—Its Importance in Securing Good Castings."* The meeting drew an unusually high attendance.

Tennessee

Carl A. Fischer, Jr.
Fischer Supply Co.
Chapter Reporter

THE MARCH 18 MEETING, held at the Hotel Patten, Chattanooga, was attended by about 65 members and their guests. First speaker at the meeting was George K. Dreher, executive director of the Foundry Educational Foundation.

Mr. Dreher said there are 15 million tons of castings made annually in the foundry industry, of which 150,000 tons are defective, adding greatly to the cost of the finished product. At 10c per pound this amounts to $30 million.

When a $5 billion business loses $30 million in defective castings, something must be done to reduce this loss, and only through education and improvement can this be done, Mr. Dreher said.

Professor E. C. Wright, Head of the Metallurgy Department of the University of Alabama was then introduced to the members.

Professor Wright said engineers in plants in the future will be licensed by the state only after taking rigid examinations. There is a shortage of graduate engineers and a great need for capable engineers.

He said that there are about 35,000 employees in Tennessee, Alabama, and Georgia foundries, and only a few young men interested in foundry engineering graduating from engineering schools yearly. We have insufficient engineers for the future and we must now interest young men in taking the engineering courses, he added.

Professor Wright suggested scholarships of $500.00 with a summer foundry job, which would make an attractive proposition to high school boys.

C. O. Bartlett of C. O. Bartlett & Snow Co., Cleveland, spoke on *"Foundry Modernization."*

Mr. Bartlett showed slides of various installations throughout the country, showing materials handling methods. In his accompanying talk, Mr. Bartlett stressed the need for careful engineering and planning before going ahead with actual installation of modern equipment. This will eliminate the bottlenecks that occur through faulty planning, he said.

Mr. Bartlett said that one way in which to plan effective plant materials and product handling is

Members of the A.F.S. Washington Chapter heard Dr. Alexander Finlayson (standing) of the Pacific Car & Foundry Co., Renton, Washington, speak on diesel engine crankshafts at the Chapter's March meeting in Seattle.

to use an overhead waterpipe as an example, and to try to rout materials in the same effective manner in which water is carried through a water system.

Mr. Bartlett concluded by recommending a number of good sand handling practices—among them measurement of sand by weight and not by cubic feet, use of large capacity screens for cooling sand and handling of sand by inclined belt where there is sufficient floor space in a foundry.

Mr. Briggs gave a short history of the steel casting industry. Steel castings were first cast in molds made of fire brick and clay, later in natural sands, and finally in the synthetic sands of today. The melting of steel followed a similar course of development, he said.

Until 1930, the speaker said, the steel founding industry had very little fundamental and technical knowledge. Such technical papers as had been presented were merely opinions and speculations.

These officers and directors of the A.F.S. Philadelphia Chapter were photographed at the April 8 meeting, held at the Engineers' Club, Philadelphia. Front row, left to right: G. H. Bradshaw, Philadelphia Navy Yard; Chairman C. L. Lane, Florence Pipe Foundry & Machine Co.; Vice-Chairman W. A. Morley, Olney Foundry Division, Link-Belt Co.; and E. C. Troy, foundry engineer, Palmyra, N. J. Rear row, left to right: C. B. Jenni, General Steel Castings Corp.; W. B. Wilkins, American Manganese Bronze Co.; and John L. Furey of the Swan-Finch Oil Corporation.

M.I.T.

Richard A. Poirier
Acting Chapter Technical Secretary
Massachusetts Institute of Technology

On March 16, Charles W. Briggs, technical director of the Steel Founder's Society of America, addressed the members of the student chapter on the subject of the steel casting industry. Before the address, there was a dinner and a short business meeting, focusing on a chapter membership drive for A.F.S. and registration with the Foundry Educational Foundation for summer work in foundries.

In 1930, the U. S. Navy became interested in the quality of steel castings and set up a program by which two things could be accomplished—(1) a method to determine the soundness of steel castings; (2) a laboratory to find out about the fundamentals of steel castings.

Early research had been done by the Germans, but the industry in the United States soon showed interest in the effects of shrinkage, hot tears, contractions, stress, sands and fluidity of molten metal. Mr. Briggs showed how such information was collected, how it was interpreted, and how it was used.

Mr. Briggs explained that the Steel Founder's Society is at present aiding many educational institutions to train young men in the fundamentals of steel casting. There are many opportunities for young students who are willing to work and are interested in quality control and research, he concluded.

The meeting closed with a brief question and answer period.

On March 25, A.F.S. National President W. B. Wallis met with the present and future officers of the chapter in Boston's Hotel Statler. Those present were: R. F. Harrington, industrial advisor to the student chapter; James O'Keefe of the MIT research staff; Gerald J. Grott, chapter chairman; Martin J. O'Brien, chapter secretary-treasurer; Roland L. Ruetz, chapter chairman-elect, and Thomas J. McLeer, vice-chairman-elect. In discussing chapter activities, Mr. Wallis described plans he had seen put into operation by other A.F.S. chapters throughout the country.

Northwestern Pennsylvania

James J. Farina
American Sterilizer Co.
Chapter Reporter

Two speakers were featured at the March meeting, held at the Moose Club, Erie, March 28. Principal speaker at the meeting was Dr. Ralph L. Lee, General Motors Corp., who spoke on "*Production Rhythm.*"

Mr. Lee stressed the human element in industry and compared it to the materials of industry. Although, he said, we have made great strides in finding facts about materials, we have failed to find a medium to measure the human element. Dr. Lee said that practical experience is virtually the only way of gaining knowledge of the subject.

Colonel Kenneth M. Momeyer of Erie outlined "The Military History of Erie and Erie County," as the coffee speaker. His theme stressed military preparedness.

Texas

W. H. Lyne
Hughes Tool Co.
Publicity Chairman

Meeting March 18 at the Texas State Hotel, Houston, members of the Chapter heard Leonard F.

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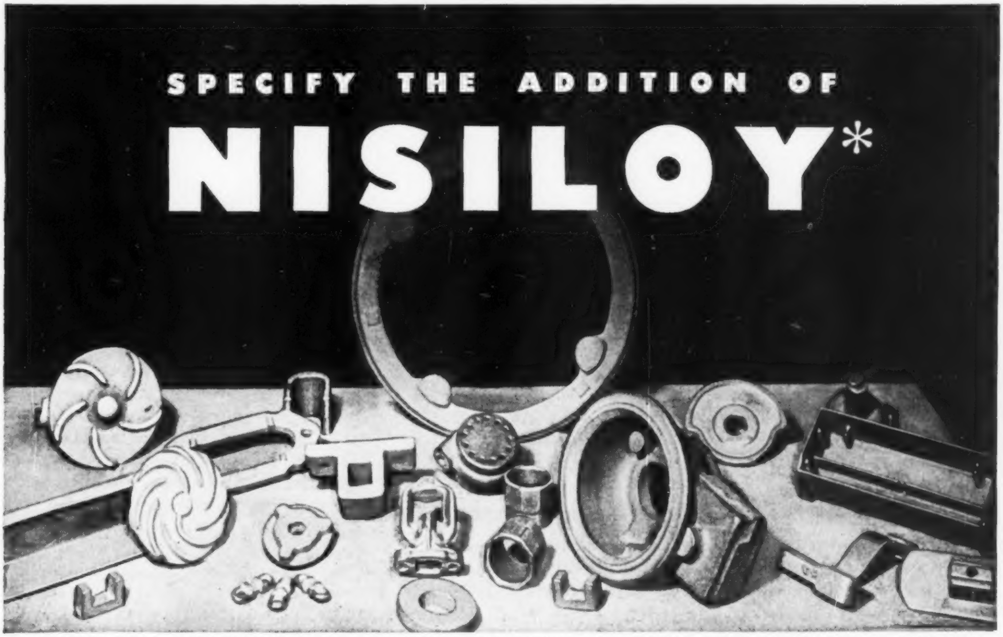

Chilling and consequent machining difficulties were encountered by a foundry specializing in cast parts like these, designed with both heavy and light sections. Nisiloy, added to the ladle, assured ready machinability after many other experiments failed.

for Better Machinability in GRAY IRON CASTINGS

Casting users profit from use of Nisiloy . . . a new, powerful, positive inoculant that promotes better machinability. It contains about 60 per cent nickel, 30 per cent silicon, balance essentially iron.

Faster, easier, lower-cost finishing of gray iron castings may be attained because Nisiloy serves to eliminate localized hard areas or chilled (white) edges and surfaces . . . regardless of sharp variations in section thickness.

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TRADE MARK

Get full information. Send for *your* free copy of a booklet that describes how the dense, gray, machinable structure secured with Nisiloy reduces machining time, tool wear, rejects and costs. Mail the coupon now.

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The International Nickel Company, Inc.
Dept. A.F., 67 Wall Street, New York 5, N. Y.
Please send me your booklet entitled
"NISILOY" for GRAY IRON CASTINGS.

Name...*Title*..................
Company...
Address...
City..*State*..................

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

Present and future officers of the A.F.S. Massachusetts Institute of Technology Student Chapter met with A.F.S. National President W. B. Wallis at the Statler Hotel, Boston, March 25. Left to right: R. L. Rietz, Chapter chairman-elect; T. J. McLeer, vice-chairman-elect; R. H. Harrington, industrial advisor to the Chapter; Mr. Wallis; James O'Keefe, of the MIT Research staff; Martin J. O'Brien, present secretary-treasurer, and Gerald J. Grott, the Massachusetts Institute of Technology Chapter chairman.

Tucker, City Pattern & Foundry Co., South Bend, Ind., speak on the fundamentals of good patternmaking and their relationship to the production of economical castings.

Mr. Tucker also stressed the cooperation between the foundryman and the patternmaker needed to attain their mutual goal—to give the customer high quality castings at the lowest possible price.

British Columbia

Norman Terry
Canadian Sumner Iron Works, Ltd.
Chapter Reporter

THE MARCH TECHNICAL MEETING, held March 22 in Vancouver, featured an address by William B. Ziegelmueller, Electric Steel Castings Co., Indianapolis, on foundry mechanization.

Mr. Ziegelmueller illustrated his talk with slides showing the transformation from manual methods of manufacturing castings to a more simple and mechanized method, now in use at his company.

The speaker described his entire foundry, commencing with the scrap pile, where a mobile crane equipped with a magnet has replaced the old wheel barrow, greatly reducing manual labor and increasing overall efficiency.

Of particular interest was Mr. Ziegelmueller's description of the cleaning process used in his steel foundry. By completely rearranging equipment and the addition of a monorail to permit a steady flow of rough castings from the mold through to the cleaning room, a complete transformation was accomplished in this foundry process.

Central Michigan

A. J. Stone
Albion Malleable Iron Co.
Publicity Chairman

THE MARCH MEETING featured as its technical speaker James H. Smith, Central Foundry Division, General Motors Corp., who spoke on *"The Need for Educational Programs in the Foundry."*

In his talk Mr. Smith cited the efforts the foundry industry is making to further foundry education, and told his audience of ways in which they could help to accelerate these efforts.

The long-range perspective for the foundry industry is not reassuring, Mr. Smith said. This is evidenced by the loss of business to other industries, he added.

Mr. Smith stated that this condition exists because during the war the industry had a high loss of technical and supervisory personnel, which was not recovered, discipline was relaxed to decrease labor turnover and has never returned to normal, the quality of raw materials was poor—which tended to increase production costs, selling prices were high, there was no concentration on cost reduction and acceptance standards were very tolerant, which resulted in a poorer quality product.

He stated that educational programs are one of the major steps in recovering and enlarging the markets for foundry products. The industry must acquaint more engineering students with the advantages of using cast materials, build up supervisory personnel by inducting better trained men into the industry, and attract young engineers into the industry to speed up the development of new projects.

Mr. Smith emphasized the necessity for improving the personnel of the organization at all levels, encouraging the re-investment of a part of the profits into better equipment, and concentrating the efforts of the entire organization on cost saving methods.

Mr. Smith outlined the program of the Foundry Educational Foundation, whose main objectives are: (1) To encourage engineers to enter the foundry industry. (2) To promote the welfare of the foundry industry among future engineers. (3) To provide instructors for high schools, trade schools, and universities.

He also, emphasized the thorough program that the American Foundrymen's Society sponsors.

In answering the question "What can we as individuals do to help accelerate the Programs"? Mr. Smith said this may be accomplished by: (1) Encouraging high schools and vocational schools to emphasize more foundry sequences. (2) Sponsoring more extension courses for people already in the industry. (3) Promoting Chapter-university, regional joint conferences and training programs for members of

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CHAPTER ACTIVITIES

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the industry. (4) Encouraging young men to enter Foundry Educational Foundation Programs. (5) Trying to develop better programs for the Society Meetings. (6) Sponsoring more plant visitations by educators and students in high schools or vocational schools.

Mo-Kan

C. W. Myers, Jr.
Morton-Myers Co.
Chapter Secretary

MEETING MARCH 23, a week after installation, officers and directors of the 40th chapter of A.F.S. set up a committee structure and named committee chairmen. Members of the various committees will be selected by the respective chairman.

The following committees have been set up with the chairmen named as follows:

Program Committee—Clarence W. Culbertson, M. W. Warren Coke Co., Kansas City, Mo., Mo-Kan Chapter, vice-chairman.

Membership Committee — Lloyd Canfield, Canfield Foundry Sand Co., Kansas City, Kan.

By-Laws Committee — W. Leslie Neville, Neville Foundry Co., Inc., North Kansas City, Mo.

Publicity Committee—Thomas F. Shadwick, Witte Engine Works, Kansas City, Mo.

An Educational Committee is expected to be set up at a later date.

Twin City

J. D. Johnson and O. J. Myers
Werner G. Smith Co.
Chapter Reporters

OVER A HUNDRED FOUNDRYMEN attended the March 3 meeting of the Twin City Chapter to hear R. A. Quadt, American Smelting & Refining Co., New York, speak on "*Producing Quality Aluminum Castings.*"

Mr. Quadt stated that the three principal causes of difficulty in the casting of aluminum are: condition of the ingots or scrap; melting practices and pouring methods; and mold design.

Aluminum ingots or scrap subjected to weather conditions tend to form an aluminum hydroxide coating which actually causes minor steam explosions when the ingots are added to the melting pot.

To counteract this, Mr. Quadt recommended storage of ingots and scrap in a dry, dark place, and sandblasting to remove corrosion products from ingots.

Preheating ingots at temperatures of about 300 F does little good in the preparation of corroded ingots for melting, the speaker said.

Pointing out that porosity can be caused by either gas or shrinkage, Mr. Quadt, said that atomic hydrogen is the only gas definitely known to dissolve in aluminum in quantity. Steam or hydrocarbons will gas a melt and therefore it is necessary to regulate the moisture in the sand, ingot corrosion and products of combustion from the burners.

Degassing can be accomplished by bubbling chlorine through the melt although this may introduce a local ventilation problem. Dry nitrogen is a less effective way to degas aluminum, the speaker said.

Cope blow holes can be reduced by minimizing the turbulence of metal entering the mold. This can be done by using proper pouring methods and proper gating.

TESTS PROVE

PATENTED* *Malleabrasive* CUTS SHOT COSTS 35% TO 45%

for Cortland Forging Division of Brewer-Titchener Corporation

35% saved on shot costs alone! That's the result of Cortland's *first* 30-day test of *Malleabrasive* in their blast cleaning operations!

"It's too good to be true!" says the superintendent, 35% savings on shot is major league stuff. Put it back on test for another 30-days. Then we'll see!"

45% savings on shot this time! 70% saved on replacement parts . . . plus a finish 100% free of scale! That's the result of the *second* 30-day test . . . even greater, more conclusive proof of Malleabrasive's terrific cost-cutting performance!

You, Too, Can Cut Your Shot Costs

Malleabrasive can cut your blast cleaning costs as much as 50% because it differs from every type of shot and grit on the market today. It's more than "heat treated" or "annealed" . . . *Malleabrasive is guaranteed* to out-perform ordinary shot and grit, when comparative tests are properly run. *Get the facts.* Send for your free copy of recent Malleabrasive test results. THE GLOBE STEEL ABRASIVE Co., Mansfield, Ohio.

Packed in new orange striped 100 pound bags.

Malleabrasive

THE GLOBE STEEL ABRASIVE CO., MANSFIELD, OHIO

• MANUFACTURERS OF METAL ABRASIVES SINCE 1907 •

*U.S. Patent #2184926 (other patents pending.)

FOUNDRY *Literature*

Readers interested in obtaining additional information on items described in Foundry Literature should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the items by means of the convenient code numbers.

Cut-Off Machines

MY101—Buehler, Ltd.'s recently-published four-page bulletin describes the company's line of laboratory abrasive cut-off machines. Varying in capacity from 3½ in. hard steel to ½ in. hard steel capacity, the machines described in this bulletin include three floor models with built-in coolant supply systems, and two machines for bench mounting requiring a recirculating cooling system or water supply and drain. Specifications, applications and list prices are supplied for each cut-off machine.

Stainless Steel Castings

MY102—A new periodical, Newscast, edited and published by the Cooper Alloy Foundry Co., is designed for distribution to men who design, specify, use or purchase stainless steel valves, fittings and engineered castings, and is devoted exclusively to providing information about the uses and properties of stainless steel castings. Just off the press and available upon request, the first issue of Newscast contains technical data on the uses of alloys in castings, a review of current technical literature, questions and answers selected at random from Cooper Alloy's Engineering department files, and a column devoted to detailed examination of a specific metallurgical design or casting problem.

Molding Machines

MY103—Latest catalog issued by the Tabor Mfg. Co. covers its complete line of foundry molding machines, including detailed specifications, drawings and photographs. Described is the new Tabor quick changeover table which permits independent setting of all four clamps on any Tabor rollover machine ranging in capacity from 600 to 3000 lb. Another machine described is the 21 in. plain jar rollover, just developed. New descriptive material on shockless molding machines described is supplied in the catalog.

Foundry Brochure

MY104—*"The Gate Is Open"* is the title of a brochure just published by the Belle City Malleable Iron Co., and the Racine Steel Castings Co., describing in detail recently-installed equipment in this highly-mechanized foundry. Designed solely for distribution to buyers of castings, this profusely-illustrated and beautifully-designed eight-page gatefold brochure provides an impressive means of acquainting customers with progressive foundry methods.

Copper-Base Alloys

MY105—Another of a series of technical papers being made available to foundrymen, metallurgists and others interested in analytical methods is *"Sulphur Determination—Volumetric Method for Copper-Base Alloys."* The paper describes a volumetric method of sulphur determination to copper-base alloys, claimed by its auther to be rapid, simple and equal in accuracy to the best empire methods. Results of determination in various copper-base alloys are tabulated and discussed and a list of references is included. Available gratis in a handy binder.

Electric Controller

MY106—A four-page illustrated bulletin describes the strip chart potentiometer controllers for foundry operations developed by the Brown Instrument Division of the Minneapolis-Honeywell Regulator Co. The bulletin describes electric proportional control, electric contact control and typical electronic control systems, with charts and operational data for each.

Non-Ferrous Metals

MY107—A 63-page booklet, *"Fundamental Characteristics of Revere Metals,"* published by the Revere Copper and Brass Corp., outlines in non-technical language the basic technology of copper, brass and bronze. Among the topics covered are copper and its alloys; cold working and hardness, annealing, corrosion, and specifications. A seven-page glossary of metallurgical terms is included. The booklet is available free of charge to interested production and technical personnel and to instructors in technical schools.

Cranes and Monorails

MY108—A 12-page catalog published by the Abell-Howe Co., describes and illustrates the company's various types of overhead handling equipment, including cranes, jibs, monorails and accessories.

Electric Industrial Trucks

MY109—Crescent Truck Co. offers a four-page bulletin illustrating and describing 20 different models of electric industrial trucks and tractors. Included is a questionnaire for determining the correct type and truck model for use under specific operating conditions.

Metallurgical Products

MY110—Metals, alloys and fine chemicals produced by Murex Limited, Rainham, Essex, England, together with their uses in industry are described in a beautifully-illustrated 24-page booklet available free of charge and printed in English, French or Spanish. Properties and applications are given for tungsten, vanadium, chromium, copper, titanium, manganese, aluminum, nickel, tantalum and ferro-niobium, boron, and cobalt metals and their alloys. Also briefly described are thermit welding, powder metallurgy, arc welding plant and electrodes. A two-page list of publications issued by Murex Limited is given at the conclusion of the booklet.

Chemical Analyses

MY111—Chemical Specialties Research Laboratories has issued a catalog containing a description of its services, which include preparation of chemical analyses of any specified product for a given fee, manufacturing formulas, and monthly analyses reports on new products. Also available are reports on chemical analyses of hundreds of products in all fields.

Abrasive Wheels

MY112—Mounted wheels and points for offhand and precision work and for grinding in hard-to-reach places are described in a new folder offered by the Simonds Abrasive Co. Available in handy file-size form, the folder shows full-size illustrations of these products, together with suggested uses and a graphic presentation of the wide range of sizes available. Also included is information on grains, grades, operating speeds and a section giving four easily-followed rules for ordering wheels and points.

Tailor-Made Flasks

MY113—Black, Sivalls & Bryson, Inc., has an entirely new way of ordering foundry flasks based on a new type of foundry flask catalog and price list and on BS&B specification and estimate sheets. All the facts about BS&B foundry equipment are given in a handy loose-leaf catalog. Catalog gives complete descriptions, detailed drawings, photographs and current prices and recommends specific flask styles for different molding methods. Catalog is available on request.

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CHAPTER ACTIVITIES

(Continued from Page 131)

More than 100 members and guests were present at the Covered Wagon on April 7 to hear V. J. Sedlon, Master Pattern Company, Cleveland, on "Pattern Making."

According to the speaker, no major change in patternmaking is contemplated for patterns primarily designed for small orders. When large production quantities of castings are required from a single pattern, more modern methods of patternmaking come into play.

Mr. Sedlon stressed the need for absolute cooperation between the foundrymen and the patternmakers. He described the basic instructions which must be given by the foundrymen to the patternmakers before the patternmakers can be expected to produce satisfactory equipment. Reconsideration of these fundamental instructions by the patternmaker often results in more accurate and less costly equipment to the foundry.

Mr. Sedlon discussed new types of materials used for patternmaking among which were the electroforming of a copper "skin" on a lead-base shell. Although patterns made by this method are usually quite heavy to handle, the reproduction of detail is excellent when making multiple equipment from a master pattern.

A series of excellent color slides including pictures of the metalcast process, lost wax process, resin patterns, and high production pattern machine equipment were exhibited and described.

Saginaw Valley

K. H. Priestley
Vassar Electroloy Products, Inc.
Chapter Reporter

THE CHAPTER'S APRIL MEETING, held April 7 at Fisher's Hotel, Frankenmuth, Mich., began with the presentation of 1949-50 Chapter officer and director nominees.

Following this, K. H. Priestley, Vassar Electroloy Products, Inc., entertained the Chapter with a talk on his recent trip to Mexico, illustrated with colored slides.

Chapter Vice-Chairman Lyle G. Clark, Buick Motor Car Co., introduced the evening's speaker, Frank G. Steinebach, Penton Publishing

Co., who spoke on *"What's Ahead in the Foundry Industry."*

Mr. Steinebach said that every foundryman has a definite part to play in the promotion of the foundry industry, and pointed out that the industry is one of the most vital to the nation's economy.

Central Indiana

W. K. Mitchell
L. W. & W. K. Mitchell Co.
Chapter Reporter

MEMBERS AND GUESTS of the Chapter, meeting in the Athenaeum, Indianapolis, April 4, heard a discussion of *"Malleable Iron Finishing,"* by E. M. Strick, Finishing Superintendent, Erie Malleable Iron Company, Erie, Pa. More than 125 foundrymen attended the meeting and dinner.

Beginning his address with a warning that buyers now are demanding a better finish on all castings, and that competition from competitive products such as stampings, forgings and plastics is getting tougher all the time, Mr. Strick pleaded for closer cooperation between customer and foundry, greater efficiency and control of cleaning operations, and closer inspection of castings.

"Much unnecessary cleaning is done because the customer is not consulted as to what machining will be done later," he said.

"Greater efficiency in cleaning can be gained by closer cooperation between all departments of the foundry. Actually, cleaning operations should begin in the pattern shop," the speaker pointed out.

"Inspection is one of the most important and one of the most undeveloped departments in the foundry," he continued. "The chief inspector should be responsible only to the general manager."

In conclusion, Mr. Strick discussed the best methods of determining the best grinding wheels for a given job; stressed the fact that castings should be cleaned *after* grinding to remove grinding marks, and brought out the importance of packing castings for annealing, to prevent warpage.

The speaker was introduced by Wilbur Wolfe, National Malleable and Steel Castings Co.

A Directors' business meeting preceded the dinner.

Chapter Vice-Chairman Howard

Creps, Frank Foundries, Inc., who was forced to resign his office recently when he was transferred to his company's Illinois plant, will be succeeded as vice-chairman by Chapter Secretary Jack W. Giddens, International Harvester Co., Indianapolis, it was announced.

Chicago

Impressions of Europe, as reported by Ray A. Witschey, A. P. Green Fire Brick Co., Chicago, were a feature of the April 4 meeting, held at the Chicago Bar Association.

Present at the meeting were members of a group of British steel foundrymen studying American foundry methods under sponsorship of the Economic Cooperation Administration, in cooperation with the National Association of Manufacturers. Those present were:

J. W. Jackson, English Steel Corp., Sheffield; W. L. Hardy, Lake & Eliot, Essex; R. MacNab, Clyde Alloy Co., Scotland; E. Daybell, K & L Steelfounders, Hertfordshire; and T. M. Lamb, Charge-hand Molder, County Durham.

The after dinner speaker, Mr. Witschey, visited foundries and other industries using refractories, in Norway, Sweden, Denmark, Holland, Belgium, Switzerland, England and France.

Much of Mr. Witschey's itinerary covered the war-devastated countries of Europe, and permitted him to compare each nation's progress in the rebuilding of its homes and industries. He was particularly impressed with the energetic way in which the people of Holland were accomplishing reconstruction of their country—one of the hardest hit by the war.

Europeans, Mr. Witschey said, look to America as their only hope of economic salvation. The Europeans are extremely pessimistic about the possibilities of another war, but are generally agreed that the United States must not give a single inch against Eastern European demands and aggression.

Following Mr. Witschey's talk, the Chapter held a round table technical meeting with J. B. Skelly, Hines Flask Co., speaking to the Non-Ferrous and Pattern Group on *"Relationship Between Good Patterns and Flask Equipment."*

The Gray Iron Group was ad-

dressed by E. J. Carmody, Chas C. Kawin Co., on *"Charging Methods."* Mr. Carmody's talk was illustrated with motion pictures.

C. W. Vokac, Whiting Corp., spoke to the Steel Group on *"Electric Furnace Control,"* and Eric Welander, Union Malleable Iron Co., addressed the Malleable Group of the Chapter on *"Melting and Analysis Control."*

Western Michigan

S. H. Davis
Campbell, Wyant & Cannon Foundry Co.
Chapter Secretary

THE APRIL 14 MEETING, held at the Cottage Inn, Muskegon, was attended by 52 members and 24 guests, who heard H. M. St. John, Crane Co., Chicago, speak on nonferrous founding practices. Mr. St. John's talk was followed by a lively discussion period, led by F. Papke. Wolverine Brass Works, Grand Rapids, and A. E. Jacobson of Grand Haven Brass Foundry, Grand Haven.

Chapter Chairman W. A. Hallberg, Lakey Foundry & Machine Co., announced that reservations were being accepted for a tour of the Oldsmobile plant at Lansing April 18.

Dr. Ralph L. Lee, General Motors Corp., was the principal speaker at the March 14 meeting. Dr. Lee's subject was *"Humanics,"* in which he cited the benefits accruing from better understanding between labor and management.

Rochester

H. G. Stellwagen
Hetzler, Foundries, Inc.
Publicity Chairman

THE APRIL MEETING was held in the Palm Room of the Seneca Hotel. The meeting was attended by 70 members and guests.

President, Max Ganzauge, called upon Henry Hanley, chairman of the Educational and Regional Conference Committee, to report on the New York Regional Conference.

Mr. Hanley said that the program of the New York State Regional Conference, to be held in Syracuse by the A.F.S. New York State Chapters, in conjunction with Syracuse University, is well under way. The committee holding the affairs of this conference is well organized and has progressed and

practically completed plans, subjects for discussion, speakers, place of conference, housing and meals. The conference will be held November 25 and 26. Headquarters—Onondaga Hotel. He urged all the members and those interested, to make reservations early.

Following the business portion of the meeting, the Chairman introduced the speaker, Charles O. Bartlett of the C. O. Bartlett and Snow Company, Cleveland.

Mr. Bartlett spoke on *"Observations on Foundry Mechanization and Modernization,"* in which he explained that modernizing begins when a foundry improves its condition by replacing the wheelbarrow with mechanical equipment.

Improvement in the foundry, in theory, can be blueprinted, the speaker said. This blueprint must take cognizance of the whole situation, from the operation of the cupola department, the molding department, the cleaning department, on through to shipping.

The whole thing must be co-ordinated so that the material moves smoothly and the best of castings are produced, he added. Mechanization can often be a medium of saving many dollars in the foundry, he concluded.

Central Ohio

H. W. Lownie, Jr.
Battelle Memorial Institute
Chapter Reporter

Beginning a new chapter policy, that of holding at least one meeting a year outside of Columbus, the Chapter met at the Bancroft Hotel, Springfield, April 11.

A large turnout of about 125 members witnessed the showing of a Naval Research Laboratory movie on the gating of molds. The film clearly showed the various types of turbulence encountered in the mold for different types of gating systems.

Clyde Sanders, American Colloid Company, Chicago, was the featured speaker of the evening. Mr. Sanders explained his belief that the grain distribution for molding sands and core sands should cover a wide range of screen sizes. Such sands are said to give the best combination of high strength, flowability, and low metal penetration.

It was emphasized that many of the additions made by foundries to

molding sands are simply expedients to correct deficiencies in the grain distribution of the original sands. For most general purposes, it was stated that sea coal, cereal, and silica flour additions could be dispensed with if the grain distribution of the sand was such that the grain size was well spread over at least five screens in the standard A.F.S. series.

Mr. Sanders also presented evidence that the thermal conductivity of molding sand can affect the occurrence of shrinkage defects in iron castings. Hard-rammed molds, and molds made from high-density grain distributions, have higher thermal conductivity than molds which contain more void space. The high-conductivity molds abstract heat more rapidly from the metal and thus provide increased chilling action which can be used to control directional solidification. Preferential solidification in castings can also be obtained by using high-conductivity special sands.

Metropolitan

George Baer
Atlas Foundry Co.
Publicity Chairman

A "DOWN TO EARTH" discussion of *"Foundry Practice on Copper-Base Alloys"* was given by George H. Bradshaw, Philadelphia Naval Shipyard, at the Essex House, Newark, N. J., April 4.

The speaker delved into the history of non-ferrous founding and made a point of the relatively few changes and advancements that have been made in the industry. He stressed the need for new developments to counteract the inroads being made by other metals and processes of manufacture.

The further use of X-ray inspection of non-ferrous castings in the future was discussed, illustrated by slides showing unsoundness in castings. Among the many phases of foundry practice discussed by Mr. Bradshaw were: gating methods, effect of mold materials and mold temperatures on shrinkage, use of dry nitrogen gas for degasifying of melts, the effect of foundry atmosphere on casting quality, synthetic sand vs. natural bond sand.

The speaker also discussed at length some of the development which the various Naval Base foundries are undertaking.

FOUNDRY FIRM Facts

A fire starting with an oil tank explosion in a warehouse operated by another company adjacent to the iron foundry of the **Hansell-Elcock Co.,** Chicago, destroyed a large section of the block-long foundry and more than a half-million dollars' worth of wooden patterns. Chicago firemen battled the 5-11 alarm fire for hours and succeeded in keeping the flames from reaching 200,000 gallons of gasoline and oil stored only 200 feet from the burning building. All of the 150 workmen on duty in the foundry escaped without injury.

Sand conditioning and handling equipment installed by **Advance Foundry Co.,** Dayton, Ohio, over the past several years recovers about 500 lb of iron daily, saves all the sand and grades and prepares it for use, and separates coke, cinders and wedges for further use.

Handling 100 to 150 tons of sand each day, the system is built around a 150 ton sand hopper, wet blast casting cleaning equipment, bucket elevator, conveyor belt, ball mill and magnetic pulley. A vibrating shakeout is not used because most of the molds made are very large and many castings are made in pits. However, pit-work around the shakeout will enable installation of a mechanical shakeout if needed. Molds are shaken out over a 6x8 ft steel grating in the floor and sand falls into a small hopper from where it moves to a conveyor belt via a vibrating feeder. The 10 ft conveyor belt ends with a magnetic pulley which removes spills, gaggers and rods. These fall into a scrap bucket and are sorted and returned to the proper departments.

The metal-free sand goes by bucket elevator to a rotary breaker screen which breaks core and sand lumps before they fall into the 150 ton hopper. Coke and cinders used for venting molds and cores, wedges and lumps too hard to be broken, fall through a tailing chute. This material plus refuse from the wet blast casting cleaning equipment goes through a ball mill (without balls) operating at about 36 rpm. Part of the waste water from the wet blast passes through the ball mill washing the coke and cinders free of sand. Water and sand return to the wet blast equipment. Wedges and coke are returned to the molding department and cinders

Patternmakers who chalked up this enviable safety record of 3398 working days without a lost-time injury in the Pattern Shop of the National Bearing Division plant of the American Brake Shoe Co., St. Louis, are, left to right: Foreman Paul Langean, Henry Celkers, Charles McDaniel, George Wagner, Herschel Ponzar, Billy Burdell and John Stelzer.

Erie Malleable Iron Co., Erie, Pa., recently installed this modern locker and toilet room, centrally located to serve all male foundry employees. Equipment includes 350 lockers with permanently installed pedestal benches between rows, steel partitioned toilets and wash basins with concealed plumbing. Individual slate showers, separately drained, are equipped with anti-scald devices. Heating and forced draft ventilation are thermostatically controlled to provide uniform temperature, winter and summer. Other facilities are free laundry service for employees, vacuum hose connections for locker cleaning and a built-in refuse chute.

to the core room. About 500 lb of metal—chips, spills, etc.—which would otherwise be lost are recovered daily. Everything is saved but the extremely fine sand which is later removed in the wet blast reclaiming equipment.

Cerium Metals Corp., announces the removal of its general offices to 153 Waverly Place, New York 14, N. Y., as of April 1.

International Harvester Co., has appropriated approximately $3,500,000 for the immediate rehabilitation and modernization of its Canton, Ohio, works, and it is anticipated that an equal amount will be added to the appropriation in the future. The rehabilitation includes a large-scale program for additional manufacturing facilities, the replacement of old equipment and machinery and a number of improvements for the betterment of working conditions. The first section of the program calls for a new pattern storage building of 11,000 sq. ft, replacing the present pattern building, which is more than 50 years old, and a new manufacturing building. The Canton works manufactures plows, cultivators and other farm implements and equipment.

Whiting Corp., Harvey, Ill., announces the appointment of the **Minnesota Supply Co.,** 706 Portland Ave., Minneapolis 15, as agent for Whiting foundry equipment. Minnesota Supply Co., whose sales territory will include the Dakotas, Minnesota, and parts of Iowa and Wisconsin, succeeds the E. R. Frost Co. of Minneapolis as Whiting sales agent in that area.

American Colloid Co. announces the removal of its offices to the Merchandise Mart Plaza, Chicago 54, Ill.

Foundry Equipment Co., Cleveland, has appointed the **Eastern Distributing Corp.,** 2219 Chamberlayne Ave., Richmond, Va., as representative for its Coleman core and mold ovens in Virginia.

Charles A. Freeman, formerly general manager of the A. P. Green Engineering & Management Co., has resigned to form his own company at Canyon City, Colo. The new corporation will acquire clay deposits, buildings and equipment now located in Canyon City.

Machinery & Supplies Co., Inc., Kansas City, Mo., has been appointed distributor for Hyster lift trucks, straddle trucks and mobile cranes in 60 counties of western Missouri, 31 counties of Oklahoma and all of Kansas.

Williams Bros., Inc., Elkhart, Ind., recently built an addition to its brass and aluminum foundry and has installed new sand mixing equipment, in order to speed up production and increase the quality of its castings output.

Ritchey Supply Co., Ltd., Toronto, Ont., Canada, announces the removal of its offices and warehouse to a modern building at 226 Geary Ave., Dufferin, Toronto 4.

LITERATURE

(Continued from Page 134)

High Temperature Mortar

MY114—Ironton's Alset—air setting mortar for high temperature applications—is described in a bulletin giving applications and methods of use. Manufacturer recommends use of Alset for laying brick, and for brush coating or spraying new or old brickwork. Product is a calcined, highly refractory, aluminum silicate, finely ground and carefully mixed. Furnished wet or dry in 200 lb steel drums or 100 lb bags, respectively.

Compressed Air Accessories

MY115—A new illustrated, condensed catalog just published by Hose Accessories Co. describes the complete line of LE-HI hose couplings, hose clamps, air valves and manifolds. Described and illustrated in Catalog No. 149 are safety-locking universal couplings, throttle valves, special high pressure couplings, long shank couplings for low pressure steam and spray hose and a complete line of hose clamps.

Pneumatic Tools and Vibrators

MY116—Dallett Co.'s precision pneumatic tools and vibrators are described in Bulletin No. 100. Included in the line are chipping hammers with coin type or spool type valves, valveless and valve type scaling and light chipping hammers, maintenance tools and valveless vibrators. Bulletin No. 200 describes a complete line of Dallett chisels.

Thermocouple Manual

MY117—A complete new thermocouple manual, Bulletin T/C 7 has been released by Wheelco Instruments Co. Available on request, the manual provides information on selection of thermocouples and protecting tubes, methods of checking thermocouples and pyrometers and installation data. A separate section of the 40-page illustrated booklet gives temperature-millivolt curves, resistance tables, pipe and wire sizes and lead wire conduit capacity in chart form. Also available is Bulletin Z6500 illustrating and describing Wheelco electronic controls.

Lift Truck Attachment

MY118—How to transport materials without pallets is described and shown in Hyster's bulletin recently issued. A hydraulically operated lift truck attachment, the device picks up many types and kinds of loads by application of side pressure. Obtainable in several different types and options of power driven load arms. Capacity of the Model 20 Load-Grab is 1780 lb; of the Model 40, 3350 lb.

Scientific Equipment

MY119—Burrell Technical Supply Co.'s revamped technical publication, *Announcer*, describes scientific equipment and includes a general interest technical article. Available on request or regularly on a no-subscription-cost basis, the *Announcer's* spring issue includes information and illustrations of a direct reading Brinell hardness reader and a portable speedy dryer for metallurgical applications.

Arc Welder Specification Catalog

MY120—Hobart Brothers Co. has released a new 8-page, 2-color catalog containing illustrations, descriptions, dimensions and specifications on its line of arc welders.

PERSONALITIES

(Continued from Page 117)

sales manager. Mr. Cobaugh has been with Harbison-Walker since 1928, and at the time of his new appointment was with the New Orleans sales office. Mr. Weir has been with the company since 1923, and succeeds **Harold S. Dunn,** who was recently promoted to general sales manager.

G. Frank Anderson, chairman of the Tennessee Chapter, terminated his 25-year connection with Chattanooga Implement & Manufacturing Co. April 30. Joining the company as salesman, Sept. 1, 1923, he served in various capacities and was vice-president and general manager when he left. Mr. Anderson was chairman of the steering committee which initiated the move toward formation of the Tennessee Chapter in November, 1947, and was subsequently elected first chairman of the group in 1948. His home address is 204 Belvoir Ave., Chattanooga 4, Tenn.

John G. Hunt, foundry metallurgist of Dominion Engineering Works, Ltd., Montreal, Que., Canada, has been appointed assistant foundry superintendent. Mr. Hunt graduated from the University of Alabama in 1937 with a degree in Metallurgical Engineering in 1937, and except for a period devoted to aircraft repair during World War II, has been working on foundry instruction, methods and costs. He is the secretary of the Eastern Canada & Newfoundland Chapter of A.F.S.

Burton C. Person, who recently completed work on his M.S. in Management at the University of Illinois, and who holds a B.S. in Metallurgy from that institution, has been appointed metallurgist with Esso Standard Oil Co., Baton Rouge, La.

S. W. Aitken, director, Hammond Lane Foundry Co. Ltd., Dublin, has just been named chairman of the Association of Ironfounders of Eire. Annual dinner of the Association was held April 28. Mr. Aitken's story *"Irish Foundry Modernizes,"* appeared in the April, 1949, issue of AMERICAN FOUNDRYMAN, page 98.

Rear Admiral William Granat, U. S. N., (Ret.) recently resigned as treasurer of Lester B. Knight & Associates, Inc., Chicago, and will move East in June.

William A. Mehner has been appointed Eastern representative for the Cleveland Flux Co., Cleveland. Mr. Mehner, who formerly represented Cleveland Flux in the Midwest, will make his headquarters at 408 Swann Ave., Baltimore.

Effective April 1, **J. H. Denton** was appointed manager of Sales Administration in the home offices of The Carborundum Co., Niagara Falls, N. Y., succeeding **D. S. Masson,** who was made assistant to the Detroit District sales manager.

Alex Cruickshank has been appointed plant engineer in charge of maintenance for McConway & Torley Corp., Pittsburgh. Mr. Cruickshank has been asso-

ciated with the New England Metallurgical Corp. and with Jones & Laughlin Steel Corp. for 16 years prior to assuming his present position. During the war, Mr. Cruickshank was superintendent of all bomb and finishing lines at Jones and Laughlin's McKeesport, Pa., plant. He is a graduate of Wentworth and Franklin Institutes and completed his post-graduate work at the Carnegie Institute of Technology and the University of Pittsburgh.

L. H. Schneider, formerly sales representative for the Duquesne Smelting Corp. in the Detroit area, recently assumed the same position with the Ajax Metal Co.

C. A. Tate, district superintendent of the Olive Hill, Ky., and Portsmouth, Ohio, works of the Harbison-Walker Refractories Co., has joined the company's Pittsburgh office as assistant divisional superintendent. Mr. Tate will be succeeded by **S. A. Catlett,** formerly superintendent of the Birmingham works.

Visitors to the A.F.S. National Office, Chicago, last month were **J. R. Jauberty,** chief engineer, Usines Metallurgiques de Marquise, and **M. Bely,** draftsman and technical interpreter for the same firm. Messrs. Jauberty and Bely are inspecting foundry installations in this country for the purpose of advising various French foundries on new developments in mechanization and production improvements.

Sylvan Grotte, formerly director of operations for the H. B. Salter Mfg. Co., Marysville, Ohio, has been appointed vice-president and sales manager of Glauber Brass, Inc., Kinsman, Ohio.

James D. Russell has been appointed sales manager and **Leonard B. Shorek** chief engineer of Young Brothers Co., Detroit. Both Mr. Russell and Mr. Shorek have been associated with the company for several years.

Richard C. McCormick, who received his B.S. in Mechanical Engineering from Ohio State University last December, has been appointed engineer-in-training with General Foundry & Mfg. Co., Flint, Mich.

James Rhyne Killian, Jr., was inaugurated as president of the Massachusetts Institute of Technology during the Institute's Mid-Century Convocation, April 2. He succeeds **Dr. Karl Taylor Compton,** who resigned recently, and who delivered the Annual Banquet Address at the 52nd A.F.S. Foundry Congress and Exhibit in Philadelphia last year.

Recipients this year of the American Society for Metals' Distinguished Service Awards for Meritorious Contributions to Progress in Alloy Steel are: **Alfred L. Boegehold,** General Motors Corp., "for his early application of the principles of hardenability to the more intelligent use of alloy steels;" **Martin H. Schmid,** Republic Steel Corp., Massilon, Ohio, "for promoting the intelligent use of alloy steels throughout American industry;" **Clyde E. Williams,** Battelle Memorial Institute for directing the War Metallurgy Committee's researches into alloy steels;" **Frank M. Masters,** Modjeski and Masters, Harrisburg, Pa., "for pioneering use of strong structural steels in long-span railroad bridges;" **Benjamin Franklin Shepherd,** Ingersoll-Rand Co., Philipsburg, N. J., "for developing the mar-tempering technique;" **Frank P. Gilligan,** The Henry Souther Engineering Co., Hartford, Conn., "for pioneer guidance and 20-year chairmanship of the SAE Committee on Steel Specifications," and **Denison Kingsley Bullens,** New England Auto Products Corp., Pottstown, Pa., "for his inspirational work in publishing American practices in steel and its heat treatment."

Bruce I. Whiting, formerly chief engineer of the Woodmanse Mfg. Co., Freeport, Ill., recently joined the Barnes Mfg. Co., Mansfield, Ohio, as an engineer, specializing in the manufacture of pumps.

OBITUARIES

Martin Rintz, 65, foundry superintendent of the Chicago works of the Continental Foundry & Machine Co., East Chicago, Ill., died at his office April 7. Long prominent in the activities of the American Foundrymen's Society's Pattern Division, Mr. Rintz was a member of its Executive Committee and chairman of its Program Committee at the time of his death. A native of Philadelphia, Mr. Rintz began his patternmaking apprenticeship in 1898 at the Cramp Shipyard in that city. He was successively, patternmaker at the Baldwin Locomotive Works, Philadelphia; employed by the Goss Printing Press Co., Chicago; and pattern shop foreman and general foreman at the Indiana Harbor, Ind., plant of American Steel Foundries. On June 1, 1928, Mr. Rintz joined the Hubbard Steel Foundry Co. of Chicago, now the Chicago works of the Continental Foundry & Machine Co., as general foreman of the No. 1 Foundry. In 1936, Mr. Rintz was appointed superintendent of the No. 2 foundry, the position he held at the time of his death. Mr. Rintz was a director of the Chicago Chapter of the American Foundrymen's Society.

Arthur Ashton, 50, works manager of the Brantford plant of the Canadian Car & Foundry Co., died January 14. Mr. Ashton had been with Canadian Car & Foundry since 1923.

Edwin J. Lame, 77, vice-chairman of the Board of Directors of the R. D. Wood Co., Philadelphia, died at his home in Wynnewood, Pa., March 26. Mr. Lame started with the company as an office boy in 1887.

Dr. Willard H. Dow, 52, president and general manager of Dow Chemical Co., Midland, Mich., died near London, Ont., March 31, when his plane crashed while trying for an emergency landing during a storm. The internationally known chemist, a graduate of the University of Michigan, succeeded to the presidency of the company on the death of his father, Dr. Herbert H. Dow, in 1930.

Index to Advertisers

Books

PUBLICATIONS TO MEET THE CURRENT NEEDS OF THE FOUNDRY INDUSTRY

		AFS MEMBER PRICES	NON-MEMBER PRICES
1.	Alloy Cast Irons Handbook (2nd Edition)	$2.75	$ 4.50
2.	Aluminum Process Control (SAE)	1.00	2.50
3.	Analysis of Casting Defects	2.50	4.25
4.	Cast Metals Handbook (3rd Edition)	4.50	7.50
5.	Centrifugal Casting	2.00	3.75
6.	Classification of Foundry Cost Factors	1.00	2.00
7.	Cupola Operations Handbook	6.00	10.00
8.	Development of the Metal Castings Industry	5.00	8.50
9.	Foundry Cost Methods	1.50	3.00
10.	Foundry Dust Control	1.00	2.00
11.	Foundry Process Control, Ferrous (SAE)	1.50	2.50
12.	Foundry Sand Testing Handbook (5th Edition)	2.25	4.00
13.	Gating and Heading Malleable Iron Castings	1.50	2.50
14.	Gating Terminology Chart	.10	.35
15.	Graphitization of White Cast Iron	2.25	4.00
16.	Malleable Foundry Sand and Core Practice	2.00	3.25
17.	Malleable Iron Melting	2.25	4.00
18.	Permanent Mold Castings Bibliography	3.00	5.00
19.	Recommended Good Practice Code and Handbook on the Fundamentals of Design, Construction, Operation and Maintenance of Exhaust Systems	3.00	5.00
20.	Recommended Good Practices for Metal Cleaning Sanitation	1.25	2.25
21.	Recommended Good Safety Practices for the Protection of Workers in Foundries	1.25	2.25
22.	Recommended Practices for Grinding, Polishing and Buffing Equipment Sanitation	.60	.60
23.	Recommended Practices for Industrial Housekeeping and Sanitation	1.00	2.00
24.	Recommended Practices for Sand Casting Aluminum and Magnesium Alloys	1.00	1.75
25.	Recommended Practices for Sand Casting of Non-Ferrous Alloys (1st Edition)	2.25	4.00
26.	Tentative Code of Recommended Practices for Testing and Measuring Air Flow	1.00	2.00
27.	AFS "Transactions" Vol. 51 (Clothbound)	3.00	15.00
	AFS "Transactions" Vols. 53, 54, 55 (Clothbound)	4.00	15.00
28.	AFS "Transactions" Vol. 56 (Clothbound)	7.00	15.00
29.	AFS Apprentice Training Standards for the Foundry Industry	1.00	2.00

Every AFS publication is basic data, reflecting actual practice in industry. Each book is written for the practical foundryman who wants authoritative information on approved techniques and materials, with down-to-earth application to practical production problems.

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• THE BUYERS' GUIDE •

As a service to A.F.S. Members and those who use Society media for promoting the usefulness of their products in the Foundry Industry, current AMERICAN FOUNDRYMAN Advertisers, and Exhibitors at the 1948 Foundry Show are presented in the Official Convention Issues Buyers' Guide.

Abrasives • Blasting

Alloy Metal Abrasive Co., 311 West Huron Street, Ann Arbor, Michigan.
The American Steel Abrasives Co., Sherman & East Sts., Galion, Ohio.
American Wheelabrator & Equipment Corp., 630 South Byrkit St., Mishawaka, Indiana.
The Carborundum Company, Niagara Falls, New York.
Carpenter Brothers, Inc., 606 West Wisconsin Avenue, Milwaukee 3, Wisconsin.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Delhi Foundry Sand Co., 6326 River Road, Cincinnati, Ohio.
The Globe Steel Abrasive Co., 238 First Ave., Mansfield, Ohio.
Harrison Abrasive Division, Metals Disintegrating Co., Inc., P. O. Box 290, Elizabeth, N. J.
National Foundry Sand Co., 2970 W. Grand Blvd., Detroit 2, Mich.
Pangborn Corporation, Hagerstown, Md.
George Pfaff, Inc., 10-61 Jackson Ave., Long Island 1, N. Y.
Pittsburgh Crushed Steel Co., 4839 Harrison St., Pittsburgh, Pa.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Steel Shot & Grit Co., Inc., 39 Warren Bridge, Boston 14, Mass.
Steel Shot Producers, Inc., Box 67, Butler, Pa.

Abrasives • Grinding

Alloy Metal Abrasive Co., 311 West Huron Street, Ann Arbor, Michigan.
The Carborundum Company, Niagara Falls, New York.
The PMS Co., 1071 Power Ave., Cleveland 14, Ohio.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.

Abrasive Testing Machines

Alloy Metal Abrasive Co., 311 West Huron Street, Ann Arbor, Michigan.

Acetylene Equipment

Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.
The Linde Air Products Company, Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Aerators

Beardsley & Piper Company, 2424 N. Cicero Ave., Chicago.
Newaygo Engineering Co., Newaygo, Mich.

After-Coolers

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Jas. A. Murphy & Co., Fifth and Vine Sts., Hamilton, Ohio.

Air Compressors

Allis Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Roots-Connersville Blower Corp., 900 West Mount St., Connersville, Ind.
Schramm, Inc., West Chester, Penn.

Air Conditioning Equipment

American Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky.
Schmieg Industries, 308 Piquette, Detroit 2, Mich.

Air Control Equipment

American Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky.
A. Schrader's Son, Div. of Scovill Manufacturing Co., Inc., 470 Vanderbilt Avenue, Brooklyn 17, N. Y.

Air Line Accessories

The Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13, Ohio.
The Dallett Company, Mascher at Lippincott St., Philadelphia, Pa.
A. Schrader's Son, Div. of Scovill Manufacturing Co., Inc., 470 Vanderbilt Avenue, Brooklyn 17, N. Y.

Alloys • Ferrous

Climax Molybdenum Company, 500 Fifth Ave., New York, N. Y.
Electro Metallurgical Div., Union Carbide and Carbon Corp., New York 17, N. Y.
Keokuk Electro-Metals Co., 429 South 4th St., Keokuk, Iowa.
Niagara Falls Smelting & Refining Division, Continental Copper & Steel Industries, Inc., 2208 Elmwood Ave., Buffalo 17, N. Y.
Tennessee Products & Chemical Corporation, American National Bank Bldg., Nashville, Tenn.
Vanadium Corp. of America, 420 Lexington Ave., New York 17, N. Y.

Alloys • Non-Ferrous

Alter Co., 1701 Rockingham Rd., Davenport, Iowa.
Apex Smelting Company, 2537 W. Taylor St., Chicago 12, Illinois.
Bohn Aluminum & Brass Corp., Aluminum Refiners Div., 1400 Lafayette Bldg., Detroit, Mich.
Bohn Aluminum & Brass Corp., Michigan Smelting & Refining Div., 1400 Lafayette Bldg., Detroit, Michigan.
Christiansen Corporation, 1515 No. Kilpatrick Ave., Chicago 51, Ill.
City Pattern Foundry & Machine Co., 1161 Harper at Rivard, Detroit 11, Mich.
Colonial Smelting & Refining Co., Columbia, Pa.
Electro Metallurgical Div., Union Carbide and Carbon Corp., New York 17, N. Y.
Electro Refractories & Alloy Corp., 344 Delaware Ave., Buffalo 2, N. Y.
Federated Metals Division, American Smelting & Refining Co., Inc., 120 Broadway, New York 5, N. Y.
Samuel Greenfield Co., Inc., 31 Stone St., Buffalo, N. Y.
Benj. Harris & Co., 11th & State Sts., Chicago Heights, Ill.
Haynes Stellite Co., Union Carbide and Carbon Corp., Kokomo, Ind.
International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
H. Kramer & Co., 1315-59 W. 21st St., Chicago, Ill.
R. Lavin & Sons, Inc., 3426 S. Kedzie Ave., Chicago, Ill.
Nassau Smelting & Refining Co., Inc., 1 Nassau Place, Tottenville, Staten Island, N. Y.
Niagara Falls Smelting & Refining Division, Continental Copper & Steel Industries, Inc., 2208 Elmwood Ave., Buffalo 17, N. Y.
North American Smelting Co., Marine Terminal, Wilmington 83, Del.
Silverstein & Pinsof, Inc., 1720 Elston, Chicago, Ill.
U. S. Reduction Co., Melville and Chicago Aves., East Chicago, Ind.
Hyman Viener & Sons, 5300 Hatcher, Richmond, Va.

Aluminum & Aluminum Alloys

Apex Smelting Company, 2537 W. Taylor St., Chicago 12, Illinois.
Christiansen Corporation, 1515 No. Kilpatrick Ave., Chicago 51, Ill.
Federated Metals Division, American Smelting & Refining Co., Inc., 120 Broadway, New York 5, N. Y.
R. Lavin & Sons, Inc., 3426 S. Kedzie Avenue, Chicago, Ill.
Niagara Falls Smelting & Refining Division, Continental Copper & Steel Industries, Inc., 2208 Elmwood Ave., Buffalo 17, N. Y.
U. S. Reduction Co., Melville and Chicago Aves., East Chicago, Ind.
Hyman Viener & Sons, 5300 Hatcher, Richmond, Va.

Annealing Boxes

Industrial Fabricating, Inc., 817 Hall Street, Eaton Rapids, Mich.
Salem Engineering Co., 714 South Broadway, Salem, Ohio.

Associations

American Gas Association, 420 Lexington Ave., New York 17, N. Y.
Crucible Mfrs. Assn., 90 West St., New York 6, N. Y.
Foundry Equipment Mfrs. Assn., Engineers Bldg., Cleveland 14, Ohio.
Gray Iron Founders' Society, 1010 Public Square Bldg., Cleveland 13, Ohio.
National Foundry Association, 120 S. LaSalle St., Chicago 3, Ill.
Non-Ferrous Founders' Society, 127 N. Dearborn St., Chicago 2, Ill.

Belting

Great Western Mfg. Co., 208-220 Choctaw St., Leavenworth, Kansas.
E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Raybestos-Manhattan, Inc., 61 Willett, Passaic, N. J.
United States Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y.

Bentonite

American Colloid Co., 363 W. Superior Street, Chicago 10, Illinois.
The Asbury Graphite Mills Inc., Asbury, Warren Co., New Jersey.
Baroid Sales Division, National Lead Company, 637 Railway Exchange Bldg., 80 East Jackson Blvd., Chicago 4, Illinois.
Carpenter Brothers, Inc., 606 West Wisconsin Avenue, Milwaukee 3, Wisconsin.
Delhi Foundry Sand Co., 6326 River Road, Cincinnati, Ohio.
Eastern Clay Products, Inc., Jackson, Ohio.
The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
The Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, Ohio.
Stoller Chemical Co., 31 North Summit Street, Akron, Ohio.
Tamms Silica Co., 228 No. La Salle St., Chicago, Ill.

Bins • Storage

Butler Bin Co., Waukesha, Wis.
Newaygo Engineering Co., Newaygo, Mich.

Blast Cleaning Equipment • Air

Alloy Metal Abrasive Co., 311 West Huron Street, Ann Arbor, Michigan.
American Wheelabrator & Equipment Corp., 630 South Byrkit St., Mishawaka, Indiana.
The Macleod Co., 2232-40 Bogen St., Cincinnati 22, Ohio.
Pangborn Corporation, Hagerstown, Md.
The W. W. Sly Manufacturing Co., 4700 Irwin Ave., Cleveland 2, Ohio.

Blast Cleaning Equipment • Airless

American Wheelabrator & Equipment Corp., 630 South Byrkit St., Mishawaka, Indiana.
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Pangborn Corporation, Hagerstown, Md.

Blast Cleaning Equipment • Hydraulic

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Blow Valves

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Spencer Turbine Co., 486 New Park Avenue, Hartford 6, Conn.
U. S. Hoffman Machinery Corp., 99 Fourth Ave., New York 3, N. Y.

Bottom Boards

The Adams Company, 100 East 4th Street, Dubuque, Iowa.
Christiansen Corporation, 1515 No. Kilpatrick Ave., Chicago 51, Ill.
Diamond Clamp & Flask Co., Box 256, Richmond, Ind.
Dougherty Lumber Co., 4300 E. 68th, Cleveland 5, Ohio.
Industrial Fabricating, Inc., 817 Hall Street, Eaton Rapids, Michigan.
The S. Obermayer Co., 2563 West 18th Street, Chicago 8, Ill.
Sterling Wheelbarrow Co., 7036 W. Walker St., Milwaukee 14, Wis.

Brick • Refractory

The Carborundum Company, Niagara Falls, New York.
Electro Refractories & Alloys Corp., 344 Delaware Ave., Buffalo 2, N. Y.
Harbison-Walker Refractories Company, 1800 Farmers Bank Bldg., Pittsburgh 22, Pa.
Laclede-Christy Co., 1711 Ambassador Bldg., St. Louis, Mo.
Lava Crucible Co., 627 Wabash Bldg., Pittsburgh 22, Pa.
National Foundry Sand Co., 2970 W. Grand Blvd., Detroit 2, Mich.
The Pyro Refractories Co., Oak Hill, Ohio.
Quigley Company, Inc., 527 Fifth Ave., New York 17, N. Y.
The Ramtite Co., Div. of the S. Obermayer Co., 2563 W. 18th St., Chicago, Ill.

Briquetting Presses

Grob Brothers, Grafton, Wis.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

Buckets • Clamshell

Blaw-Knox Div. of Blaw-Knox Company, Blawnox, Pa.
Harnischfeger Corp., P. O. Box 290, Milwaukee, Wis.

Buckets • Elevating

The C. O. Bartlett & Snow Company, 6200 Harvard Avenue, Cleveland, Ohio.
Chain Belt Company, 1725 West Bruce Street, Milwaukee 4, Wisconsin.
Great Western Mfg. Co., 208-220 Choctaw St., Leavenworth, Kan.

Burrs

Severance Tool Ind., Inc., Saginaw, Mich.

Buffing and Polishing Machines

Pratt & Whitney, Div. Niles Bement Pond Co., West Hartford 1, Conn.

Castings • Ferrous

Wheland Co., 2727 S. Broad St., Chattanooga, Tenn.

Castings • Non-Ferrous

International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Hyman Viener & Sons, 5300 Hatcher, Richmond, Va.

Cement • Refractory

Alpha-Lux Co., Inc., 155 John St., New York 1, N. Y.
Bay State Crucible Co., Taunton, Mass.
Jos. Dixon Crucible Co., Jersey City 3, N. J.
The Ironton Fire Brick Co., Ironton, Ohio.
Laclede-Christy Co., 1711 Ambassador Bldg., St. Louis, Mo.
Pittsburgh Metals Purifying Corp., 1352 Marvista St., N.S., Pittsburgh 12.
The Pyro Refractories Co., Oak Hill, Ohio.
Quigley Company, Inc., 527 Fifth Ave., New York 17, N. Y.
The Ramtite Co., Div. of the S. Obermayer Co., 2563 W. 18th St., Chicago, Ill.
Ross-Tacony Crucible Co., Robbins & Milnor Sts., Tacony, Philadelphia 35, Pa.

Centrifugal Casting Machines

Allis Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee, Wis.
Centrifugal Casting Machine Co., P. O. Box 947 (508 Orpheum Bldg.), Tulsa, Oklahoma.
Herman Pneumatic Machine Co., 1806 Union Bank Bldg., Pittsburgh 22, Pa.

Chains • Industrial

Chain Belt Company, 1725 West Bruce Street, Milwaukee 4, Wisconsin.
Columbus McKinnon Chain Corp., Fremont St., Tonawanda, N. Y.
The Jeffrey Mfg. Co., 977 N. Fourth Street, Columbus 16, Ohio.
Link-Belt Company, 300 W. Pershing Rd., Chicago 9, Ill.

Chaplets and Nails

Capewell Manufacturing Co., 60 Governor St., Hartford 2, Conn.
Chicago Chaplet Co., 2047 N. Wood St., Chicago, Ill.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Standard Horse Nail Corp., New Brighton, Penn.

Chisels • Chipping

Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N. Y.
The Dallett Company, Mascher at Lippincott St., Philadelphia, Pa.
Dayton Pneumatic Tool Company, P. O. Box 747, 8-10 Norwood Ave., Dayton, Ohio.

Clay • Bonding

American Colloid Co., 363 W. Superior Street, Chicago 10, Illinois.
Eastern Clay Products, Inc., Jackson, Ohio.
The Pyro Refractories Co., Oak Hill, Ohio.
Stoller Chemical Co., 31 North Summit Street, Akron, Ohio.
Whitehead Brothers Co., 324 W. 23rd Street, New York 11, N. Y.

Clay • Fire

Carpenter Brothers, Inc., 606 West Wisconsin Avenue, Milwaukee 3, Wisconsin.
Delhi Foundry Sand Co., 6326 River Road, Cincinnati, Ohio.
Eastern Clay Products, Inc., Jackson, Ohio.
Great Lakes Foundry Sand Co., 720 United Artists Bldg., Detroit 26, Mich.
The Ironton Fire Brick Co., Ironton, Ohio.
Laclede-Christy Co., 1711 Ambassador Bldg., St. Louis, Mo.
National Foundry Sand Co., 2970 W. Grand Blvd., Detroit 2, Mich.
New Jersey Silica Sand Co., Box 71, Millville, N. J.
The Pyro Refractories Co., Oak Hill, Ohio.

Cleaning • Surface Treatment

E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Pangborn Corporation, Hagerstown, Md.

Coke • Foundry

Hickman, Williams & Co., 1500 Walnut St., Philadelphia 2, Pa.
Republic Coal & Coke Co., 8 S. Michigan Ave., Chicago 3, Ill.
Semet-Solvay Div., Allied Chemical & Dye Corp., 40 Rector St., New York 7, N. Y.
Tennessee Products & Chemical Corporation, American National Bank Bldg., Nashville, Tenn.

Coke • Petroleum

Debevoise-Anderson Co., Inc., 55 Liberty St., New York 5, N. Y.
Republic Coal & Coke Co., 8 S. Michigan Ave., Chicago 3, Ill.

Conveying and Materials Handling Equipment

Ajax Flexible Coupling Co., Inc., English & Portage Sts., Westfield, New York.
The C. O. Bartlett & Snow Company, 6200 Harvard Avenue, Cleveland, Ohio.
Bell Aircraft Corp., Prime Mover Division, P. O. Box 1, Buffalo 5, New York.
Chain Belt Company, 1725 West Bruce Street, Milwaukee 4, Wisconsin.
Chisholm-Moore Hoist Corp., Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
The Frank G. Hough Co., Libertyville, Ill.
Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore.
The Jeffrey Mfg. Co., 977 N. Fourth St., Columbus 16, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Material Movement, Industries, Inc., 9257 Laramie, Skokie, Ill.
Mathews Conveyors Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington Blvd., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Palmer-Bee Co., 1701 Poland Ave., Detroit 12, Michigan.
Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J.
Royer Foundry & Machine Co., 158 Pringle St., Kingston, Pa.

Standard Conveyor Co., North St. Paul 9, Minn.
Syntron Co., 545 Lexington, Homer City, Pa.
United States Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y.
Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4, Mich.
Yale & Towne Mfg. Co., Roosevelt Blvd. & Haldeman Ave., Philadelphia 15, Pa.

Core and Mold Washes

Bloomsbury Graphite Co., 30 Church St., Bloomsbury, New Jersey.
The Borden Company, Chemical Division, 350 Madison Ave., New York 17, N. Y.
The Dayton Oil Company, 1201 E. Monument Ave., Dayton, Ohio.
Delta Oil Products Co., 6263 N. Cedarburg Rd., Milwaukee 9, Wisc.
The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh 22, Pa.
The Hill & Griffith Co., Cincinnati, Chicago, St. Louis.
Houghland & Hardy—Hardy Sand Co., Evansville, Ind.
The J. S. McCormick Co., 25th St. & A.V.R.R., Pittsburgh 22, Pa.
The S. Obermayer Co., 2563 West 18th Street, Chicago 8, Ill.
The Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, Ohio.
Springfield Facing Co., Williamsett, Mass. and Harrison, N. J.
Stoller Chemical Co., 31 North Summit Street, Akron, Ohio.
Thiem Products, Inc., 746 W. Virginia St., Milwaukee 4, Wis.
United Oil Mfg. Co., 1429-31 Walnut St., Erie, Penn.
The United States Graphite Co., 1621 Holland Ave., Saginaw, Mich.

Core Binders, Oils and Compounds

American Cyanamid Co., Plastics Dept., 30 Rockefeller Plaza, New York 20, N. Y.
The Borden Company, Chemical Division, 350 Madison Ave., New York 17, N. Y.
Certified Core Oil Division, Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Illinois.
Corn Products Sales Company, 17 Battery Place, New York 4, N. Y.
The Dayton Oil Company, 1201 E. Monument Ave., Dayton, Ohio.
Delta Oil Products Co., 6263 N. Cedarburg Rd., Milwaukee 9, Wisc.
The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
The Fordath Engineering Co., Ltd., Hamblet Works, Albion Road, West Bromwich, Staffordshire, England.
Hercules Powder Co., Wilmington 99, Del.
The Hill & Griffith Co., Cincinnati, Chicago, St. Louis.
E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Chas. A. Krause Milling Co., Milwaukee, Wis.
Lauhoff Grain Co., P. O. Box 571, Danville, Ill.
The J. S. McCormick Co., 25th St. & A.V.R.R., Pittsburgh 22, Pa.
The S. Obermayer Co., 2563 West 18th Street, Chicago 8, Ill.
Pennsylvania Foundry Supply & Sand Co., Ashland below E. Lewis Sts., Phila. 24, Pa.
Penola, Inc., 221 N. La Salle St., Chicago 1, Ill.
Werner G. Smith Co., 2191 West 110th Street, Cleveland 2, Ohio.
The Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, Ohio.
Stoller Chemical Co., 31 North Summit Street, Akron, Ohio.
Swan-Finch Oil Corp., RCA Bldg., West, New York 20, N. Y.
Thiem Products, Inc., 746 W. Virginia St., Milwaukee 4, Wis.
United Oil Mfg. Co., 1429-31 Walnut St., Erie, Penn.
Velsicol Corp., 330 E. Grand Ave., Chicago, Ill.

Core Blowers

Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Wm. Demmler & Bros., Kewanee, Ill.
International Molding Machine Co., 1201 North 12th St., La Grange Park, Ill.
Martin Engineering Co., 704 Rose Street, Kewanee, Ill.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.
The Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland 14, Ohio.
Redford Iron & Equipment Co., 21315 W. McNichols Rd., Detroit 19, Mich.
The Tabor Manufacturing Co., 6224 Tacony St., Philadelphia 35, Pa.

Core Box Cleaner

E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Tamms Silica Co., 228 No. La Salle St., Chicago, Ill.

Core Conveying Equipment

Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore.
Mathews Conveyors Co., Ellwood City, Pa.
Palmer-Bee Co., 1701 Poland Ave., Detroit 12, Mich.

Core Grinders

Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

Core Knockout Equipment

The Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13, Ohio.
The Hydro-Blast Corp., 2550 N. Western Ave., Chicago, Ill.
Pangborn Corp., Hagerstown, Md.

Core Making Machines

Arcade Mfg. Div., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.
Beardsley & Piper Company, 2424 N. Cicero Ave., Chicago.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Crescent Machine Div., Rockwell Mfg. Co., 600 E. Vienna, Milwaukee, Wisc.
Davenport Machine & Foundry Co., 1628 W. Fourth St., Davenport, Iowa.
The Fordath Engineering Co., Ltd., Hamblet Works, Albion Road, West Bromwich, Staffordshire, England.
Herman Pneumatic Machine Co., 1806 Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., 1201 North 12th St., La Grange Park, Ill.
The Johnston & Jennings Co., 877 Addison Rd., Cleveland, Ohio.
The Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland 14, Ohio.
The Tabor Manufacturing Co., 6224 Tacony St., Philadelphia 35, Pa.

Core Ovens

Despatch Oven Co., 619 Eighth St., S. E., Minneapolis 14, Minn.
The Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Induction Heating Corp., 181 Wythe Ave., Brooklyn 11, N. Y.
The Kirk & Blum Mfg. Co., 2876 Spring Grove, Cincinnati, Ohio.
Carl Mayer, 3031 Euclid Ave., Cleveland, Ohio.
Stroman Furnace & Engineering Co., 9900 Franklin Ave., Franklin Park, Ill.

Core Paste

The Borden Company, Chemical Division, 350 Madison Ave., New York 17, N. Y.
Corn Products Sales Company, 17 Battery Place, New York 4, N. Y.
Eastern Clay Products, Inc., Jackson, Ohio.
George F. Pettinos, Inc., 1206 Locust Street, Philadelphia, Pa.
The Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, Ohio.
Springfield Facing Co., Williamsett, Mass. and Harrison, N. J.
Whitehead Brothers Co., 324 W. 23rd Street, New York 11, N. Y.

Core Plates

Christiansen Corporation, 1515 No. Kilpatrick Ave., Chicago 51, Ill.
Diamond Clamp & Flask Co., Box 256, Richmond, Ind.
Sterling Wheelbarrow Co., 7036 W. Walker St., Milwaukee 14, Wis.

Core Racks

The Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
The Kirk & Blum Mfg. Co., 2876 Spring Grove, Cincinnati, Ohio.

Core Rod Straighteners and Shearing Machinery

Alter Co., 1701 Rockingham Rd., Davenport, Iowa.

Core Room Equipment

Beardsley & Piper Company, 2424 N. Cicero Ave., Chicago.
The Freeman Supply Co., 1152 E. Broadway, Toledo 5, Ohio.
Martin Engineering Co., 704 Rose St., Kewanee, Ill.

Core Sand Reclamation

The Frank G. Hough Co., Libertyville, Ill.
Houghland & Hardy—Hardy Sand Co., Evansville, Ind.
The Hydro-Blast Corp., 2550 N. Western Ave., Chicago, Ill.
Manley Sand Co., Rockton, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago 6, Ill.
Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.

Core Vents

Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Wm. Demmler & Bros., Kewanee, Ill.
The PMS Co., 1071 Power Ave., Cleveland 14, Ohio.
United Compound Co., Inc., 328 S. Park Ave., Buffalo 4, N. Y.

Core Washes

Bloomsbury Graphite Co., 30 Church St., Bloomsbury, New Jersey.
The Borden Company, Chemical Division, 350 Madison Ave., New York 17, N. Y.
Corn Products Sales Company, 17 Battery Place, New York 4, N. Y.
Delta Oil Products Co., 6263 N. Cedarburg Rd., Milwaukee 9, Wisc.
The J. S. McCormick Co., 25th St. & A.V.R.R., Pittsburgh 22, Pa.
Frederic B. Stevens, Inc., 1800 - 18th Street, Detroit 16, Mich.
The United States Graphite Co., 1621 Holland Ave., Saginaw, Mich.

Couplings • Flexible

Ajax Flexible Coupling Co., Inc., English & Portage Sts., Westfield, New York.

Cranes • Foundry

Cleveland Tramrail Div., Cleveland Crane & Engrg. Co., 1155 W. 283rd St., Wickliffe, Ohio.
Harnischfeger Corp., P. O. Box 290, Milwaukee, Wis.
Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore.
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15628 Lathrop Ave., Harvey, Ill.

Cranes • Tractor

Hyster Co., 2902 N.E. Clackamas St., Portland 8, Oregon.

Crucibles

American Crucible Co., Washington Ave., North Haven, Conn.
Bay State Crucible Co., Taunton, Mass.
Jos. Dixon Crucible Co., Jersey City 3, N. J.
Lava Crucible Co., 627 Wabash Bldg., Pittsburgh 22, Pa.
National Crucible Co., Mermaid Lane & Queen St., Philadelphia 18, Pa.
Ross-Tacony Crucible Co., Robbins & Milnor Sts., Tacony, Philadelphia 35, Pa.
Vesuvius Crucible Co., P. O. Box 8275, Swissvale, Pittsburgh 18, Pa.

Cupolas

Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15628 Lathrop Ave., Harvey, Ill.

Cupola Blowers

Allis Chalmers Mfg. Co., 1126 S. 70th Street, Milwaukee, Wis.
The J. S. McCormick Co., 25th St., & A.V.R.R., Pittsburgh 22, Pa.
Roots-Connersville Blower Corp., 900 West Mount St., Connersville, Ind.
Spencer Turbine Co., 486 New Park Avenue, Hartford 6, Conn.

Cupola Chargers

Cleveland Tramrail Div., Cleveland Crane & Engrg. Co., 1155 W. 283rd St., Wickliffe, Ohio.
Harnischfeger Corp., P. O. Box 290, Milwaukee, Wisconsin.
Modern Equipment Co., Port Washington, Wis.

Cupola Control Equipment

The Foxboro Co., Neponset Avenue, Foxboro, Mass.

Cupola Dust Collectors

The C. O. Bartlett & Snow Company, 6200 Harvard Avenue, Cleveland, Ohio.
Claude B. Schneible Co., 2827 - 25th Street, Detroit, Michigan.

Cutoff Machines

The Fordath Engineering Co., Ltd., Hamblet Works, Albion Road, West Bromwich, Staffordshire, England.
Grob Brothers, Grafton, Wis.
Oliver Machinery Co., 1025 Clancy Ave. N.E., Grand Rapids 2, Mich.
The Tabor Manufacturing Co., 6224 Tacony St., Philadelphia 35, Pa.

Dust Collecting Equipment • Dry

Alloy Metal Abrasive Co., 311 West Huron Street, Ann Arbor, Michigan.
American Air Filter Co., Inc., 215 Central Avenue, Louisville 8, Ky.
American Wheelabrator & Equipment Corp., 630 South Byrkit St., Mishawaka, Indiana.
The Johnson-March Corp., 1724 Chestnut St., Philadelphia 3, Pa.
The Kirk & Blum Mfg. Co., 2876 Spring Grove, Cincinnati, Ohio.
The Macleod Co., 2232-40 Bogen St., Cincinnati 22, Ohio.
The W. W. Sly Manufacturing Co., 4700 Irwin Ave., Cleveland 2, Ohio.
U. S. Hoffman Machinery Corp., 99 Fourth Ave., New York 3, N. Y.

Dust Collecting Equipment • Wet

American Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky.
The C. O. Bartlett & Snow Company, 6200 Harvard Avenue, Cleveland, Ohio.
The Kirk & Blum Mfg. Co., 2876 Spring Grove, Cincinnati, Ohio.
Claude B. Schneible Co., 2827 - 25th Street, Detroit, Mich.

Electrodes

Air Reduction Sales Co., 60 E. 42nd Street, New York 17, N. Y.
Arcos Corporation, 1500 South 50th Street, Philadelphia 43, Penna.
International Graphite & Electrode Corp., St. Marys, Pa.
International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Engineering Service • Foundry

Frank D. Campbell, 332 S. Michigan Avenue, Chicago, Ill.
The Fellows Corp., 1012 N. Third Street, Milwaukee 3, Wisconsin.
Giffels & Vallet, Marquette Bldg., Detroit, Michigan.
Charles C. Kawin Co., 431 S. Dearborn St., Chicago 5, Ill.
Lester B. Knight & Associates, Inc., 600 W. Jackson Blvd., Chicago, Ill.; 30 Church St., New York, N. Y.
W. G. Reichert Engineering Co., 1060 Broad St., Newark 2, N. J.

Exothermic Materials (Pipe Eliminators)

Exomet, Inc., Maple Ave., Conneaut, Ohio.
Exothermic Research Products, 785 Northland Avenue, Buffalo 11, N. Y.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.

Facings • Foundry

The Asbury Graphite Mills Inc., Asbury, Warren Co., New Jersey.
Bloomsbury Graphite Co., 30 Church Street, Bloomsbury, New Jedsey.
The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Harbison-Walker Refractories Company, 1800 Farmers Bank Bldg., Pittsburgh 22, Pa.
The Hill & Griffith Co., Cincinnati, Chicago, St. Louis.
The S. Obermayer Co., 2563 West 18th Street, Chicago 8, Ill.
Penn-Rillton Co., 324 W. 23rd., New York 11, N. Y.
George F. Pettinos, Inc., 1206 Locust Street, Philadelphia, Pa.
The Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, Ohio.
Springfield Facing Co., Williamset, Mass., and Harrison, N. J.
Frederic B. Stevens, Inc., 1800 - 18th Street, Detroit 16, Mich.
Stoller Chemical Co., 31 North Summit Street, Akron, Ohio.
The United States Graphite Co., 1621 Holland Ave., Saginaw, Mich.
Whitehead Brothers Co., 324 W. 23rd Street, New York 11, N. Y.

Ferro-Alloys

Climax Molybdenum Company, 500 Fifth Ave., New York, N. Y.
Hickman, Williams & Co., 1500 Walnut Street, Philadelphia 2, Pa.
The Jackson Iron & Steel Co., Jackson, Ohio.
Keokuk Electro-Metals Co., 429 South 4th St., Keokuk, Iowa.
Tennessee Products & Chemical Corporation, American National Bank Bldg., Nashville, Tenn.

Fire Brick

G. & W. H. Corson, Inc., Plymouth Meeting, Pa.
Harbison-Walker Refractories Company, 1800 Farmers Bank Bldg., Pittsburgh 22, Pa.
The Ironton Fire Brick Co., Ironton, Ohio.
The Pyro Refractories Co., Oak Hill, Ohio.
Quigley Company, Inc., 527 Fifth Ave., New York 17, N. Y.

Flask Bushings

Universal Engineering Co., Frankenmuth, Michigan.

Flask Lumber

Dougherty Lumber Co., 4300 E. 68th, Cleveland 5, Ohio.

Flask Pins

Universal Engineering Co., Frankenmuth, Michigan.

Flask Trimmings and Jackets

The Adams Company, 100 East 4th Street, Dubuque, Iowa.
Arcade Mfg. Div., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.
Crescent Machine Div., Rockwell Mfg. Co., 600 E. Vienna, Milwaukee, Wisconsin.
Diamond Clamp & Flask Co., Box 256, Richmond, Ind.
The Fremont Flask Co., 1000 Wolfe Avenue, Fremont, Ohio.
The Hines Flask Co., 3431 W. 140th Street, Cleveland 11, Ohio.
Industrial Fabricating, Inc., 817 Hall Street, Eaton Rapids, Mich.

Flasks • Aluminum

The Adams Company, 100 East 4th Street, Dubuque, Iowa.
The Fremont Flask Co., 1000 Wolfe Ave., Fremont, Ohio.
The Hines Flask Co., 3431 W. 140th Street, Cleveland 11, Ohio.

Flasks • Magnesium

The Fremont Flask Co., 1000 Wolfe Avenue, Fremont, Ohio.

Flasks • Steel

The Hines Flask Co., 3431 W. 140th Street, Cleveland 11, Ohio.
Industrial Fabricating, Inc., 817 Hall Street, Eaton Rapids, Mich.
Sterling Wheelbarrow Co., 7036 W. Walker St., Milwaukee 14, Wis.

Flasks • Wood

The Adams Company, 100 East 4th Street, Dubuque, Iowa.
Arcade Mfg. Div., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.
Crescent Machine Div., Rockwell Mfg. Co., 600 E. Vienna, Milwaukee, Wis.
Diamond Clamp & Flack Co., Box 256, Richmond, Ind.
Dougherty Lumber Co., 4300 E. 68th, Cleveland 5, Ohio.
The S. Obermayer Co., 2563 West 18th Street, Chicago 8, Ill.

Flexible Shaft Equipment

Pratt & Whitney, Div. Niles Bement Pond Co., West Hartford 1, Conn.

Fluxes • Cupola

The Cleveland Flux Company, 1026-34 Main Ave., N.W., Cleveland, Ohio.
Delhi Foundry Sand Co., 6326 River Road, Cincinnati, Ohio.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Pittsburgh Metals Purifying Corp., 1352 Marvista St., N.S., Pittsburgh 12, Pa.
The Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, Ohio.
Thiem Products, Inc., 746 W. Virginia St., Milwaukee 4, Wis.

Fluxes • Ladle

The Cleveland Flux Company, 1026-34 Main Ave., N.W., Cleveland, Ohio.
Exothermic Research Products, 785 Northland Ave., Buffalo 11, N. Y.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.

Fluxes • Non-Ferrous

Apex Smelting Company, 2537 W. Taylor St., Chicago 12, Illinois.
The Cleveland Flux Company, 1026-34 Main Ave., N.W., Cleveland, Ohio.
Exothermic Research Products, 785 Northland Ave., Buffalo 11, N. Y.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
R. Lavin & Sons, Inc., 3426 S. Kedzie Ave., Chicago, Ill.
Pittsburgh Metals Purifying Corp., 1352 Marvista St., N.S., Pittsburgh 12, Pa.
Thiem Products, Inc., 746 W. Virginia Street, Milwaukee 4, Wis.

Fluxes • Welding

The Linde Air Products Company, Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Pittsburgh Metals Purifying Corp., 1352 Marvista St., N.S., Pittsburgh 12, Pa.

Foundry Supplies • General

Alter Co., 1701 Rockingham Rd., Davenport, Iowa.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Delta Oil Products Co., 6263 N. Cedarburg Rd., Milwaukee 9, Wis.

The Hill & Griffith Co., Cincinnati, Chicago, St. Louis.
Frederic B. Stevens, Inc., 1800 - 18th Street, Detroit 16, Mich.
Springfield Facing Co., Williamsett, Mass., and Harrison, N. J.
Jervis B. Webb Co., 8951 Alpine Avenue, Detroit 4, Mich.

Furnace Linings

Alpha-Lux Co., Inc., 155 John St., New York 1, N. Y.
American Crucible Co., Washington Avenue, North Haven, Conn.
Bay State Crucible Co., Taunton, Mass.
Campbell-Hausfeld Co., 801 Moore, Harrison, Ohio.
Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh 22, Pa.
Lava Crucible Co., 627 Wabash Building, Pittsburgh 22, Pa.
National Crucible Co., Mermaid Lane and Queen St., Philadelphia 18, Pa.
The Ramtite Co., Div. of the S. Obermayer Co., 2563 W. 18th St., Chicago, Ill.
Stroman Furnace & Engineering Co., 9900 Franklin Ave., Franklin Park, Ill.

Furnaces • Aluminum and Magnesium Melting

Ajax Metal Co., Frankford Ave. & Richmond St., Philadelphia, Pa.
Campbell-Hausfeld Co., 801 Moore, Harrison, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 W. Hubbard St., Chicago 12, Ill.
The Randall Foundry Equipment Corp., Newburgh Station, Cleveland, Ohio.
Stroman Furnace & Engineering Co., 9900 Franklin Ave., Franklin Park, Ill.

Furnaces • Crucible

Campbell-Hausfeld Co., 801 Moore, Harrison, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 W. Hubbard St., Chicago 12, Ill.
Carl Mayer, 3031 Euclid Ave., Cleveland, Ohio.
Stroman Furnace & Engineering Co., 9900 Franklin Ave., Franklin Park, Ill.

Furnaces • Electric

Ajax Metal Co., Frankford Ave. & Richmond St., Philadelphia, Pa.
Detroit Electric Furnace Div., Kuhlman Electric Co., Bay City, Mich.
Lindberg Engineering Co., Fisher Furnace Div., 2450 W. Hubbard St., Chicago 12, Ill.
Carl Mayer, 3031 Euclid Ave., Cleveland, Ohio.
Pittsburgh Lectromelt Furnace Corp., Foot 32nd St., Pittsburgh, Pa.
Salem Engineering Co., 714 South Broadway, Salem, Ohio.
Whiting Corp., 15628 Lathrop Ave., Harvey, Ill.

Furnaces • Gas or Oil Fired

Campbell-Hausfeld Co., 801 Moore, Harrison, Ohio.
Despatch Oven Company, 619 Eighth Street, S.E., Minneapolis 14, Minn.
Lindberg Engineering Co., Fisher Furnace Div., 2450 W. Hubbard St., Chicago 12, Ill.
Carl Mayer, 3031 Euclid Ave., Cleveland, Ohio.
The Randall Foundry Equipment Corp., Newburgh Station, Cleveland, Ohio.
Salem Engineering Co., 714 South Broadway, Salem, Ohio.
Stroman Furnace & Engineering Co., 9900 Franklin Ave., Franklin Park, Ill.

Furnaces • Heat Treating

Despatch Oven Company, 619 Eighth Street, S.E., Minneapolis 14, Minn.
The DoALL Co., 254 N. Laurel Avenue, Des Plaines, Ill.
The Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 W. Hubbard St., Chicago 12, Ill.
Carl Mayer, 3031 Euclid Ave., Cleveland, Ohio.
Salem Engineering Co., 714 South Broadway, Salem, Ohio.

Goggles

Air Reduction Sales Co., 60 E. 42nd Street, New York 17, N. Y.
American Optical Company, 14 Mechanic St., Southbridge, Mass.
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1, N. Y.
Safety Clothing & Equipment Company, 7016 Euclid Ave., Cleveland 3, Ohio.

Graphite Products

The Asbury Graphite Mills, Inc., Asbury, Warren Co., New Jersey
Bloomsbury Graphite Co., 30 Church Street, Bloomsbury, New Jersey.
Jos. Dixon Crucible Co., Jersey City 3, N. J.
The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
The Hill & Griffith Co., Cincinnati, Chicago, St. Louis.
International Graphite & Electrode Corp., St. Marys, Pa.
Lava Crucible Co., 627 Wabash Building, Pittsburgh 22, Pa.
National Crucible Co., Mermaid Lane & Queen St., Philadelphia 18, Pa.
George F. Pettinos, Inc., 1206 Locust Street, Philadelphia, Pa.
Ross-Tacony Crucible Co., Robbins & Milnor Sts., Tacony,Philadelphia 35, Pa.
The Smith Facing & Supply Co., 1857 Carter Rd., Cleveland 13, Ohio.
Springfield Facing Co., Williamsett, Mass., and Harrison, N. J.
The United States Graphite Co., 1621 Holland Ave., Saginaw, Mich.

Graphite Stopper Heads

Jos. Dixon Crucible Co., Jersey City 3, N. J.
Ross-Tacony Crucible Co., Robbins & Milnor Sts., Tacony, Philadelphia 35, Pa.
Vesuvius Crucible Co., P. O Box 8275, Swissvale, Pittsburgh 18, Pa.

Grinders • Electric

Buckeye Tools Corp., 29 W. Apple Street, Dayton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N. Y.
Independent Pneumatic Tool Co., 175 North State St., Aurora, Ill.
The Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati 4, Ohio.

Grinders • Flexible Shaft

Martindale Electric Co., 1347 Hird Avenue, Cleveland 7, Ohio.

Grinders • Floor Stand

Fox Grinders Inc., 622 Oliver Building, Pittsburgh, Pa.

Grinders • Pneumatic

Buckeye Tools Corp., 29 W. Apple Street, Dayton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N. Y.
Cleco Division of the Reed Roller Bit Company, P. O. Box 2119, Houston 1, Texas.
Independent Pneumatic Tool Co., 175 North State St., Aurora, Ill.
Master Pnuematic Tool Co.,Inc.,Orwell, Ohio.
The Rotor Tool Co., 17325 Euclid Avenue, Cleveland 12, Ohio.

Grinders • Swing Frame

Fox Grinders Inc., 622 Oliver Building, Pittsburgh, Pa.

Grinding Wheels

The Carborundum Company, Niagara Falls, New York.
The Cleveland Quarries Company, 1740 E. Twelfth St., Cleveland 14, Ohio.
Electro Refractories & Alloys Corp., 344 Delaware Ave., Buffalo 2, N. Y.
Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7, Mich.
George Pfaff, Inc., 10-61 Jackson Avenue, Long Island 1, N. Y.
Precision Grinding Wheel Co., Inc., 8301 Torresdale Ave., Philadelphia 36, Pa.
Raybestos-Manhattan, Inc., 61 Willett, Passaic, N. J.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
United States Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y.

Hammers • Pneumatic

Cleco Division of the Reed Roller Bit Company, P. O. Box 2119, Houston 1, Texas.
The Dallett Company, Mascher at Lippincott St., Philadelphia, Pa.
Dayton Pneumatic Tool Company, P. O. Box 747, 8-10 Norwood Ave., Dayton, Ohio.
Independent Pneumatic Tool Co., 175 North State St., Aurora, Ill.
Master Pneumatic Tool Co.,Inc.,Orwell, Ohio.
Schramm Inc., West Chester, Pa.

Heaters • Ladle and Mold

The Macleod Co., 2232-40 Bogen Street, Cincinnati 22, Ohio.

Helmets • Blasting

The Macleod Co., 2232-40 Bogen Street, Cincinnati 22, Ohio.
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1, N. Y.
The W. W. Sly Manufacturing Co., 4700 Irwin Ave., Cleveland 2, Ohio.

Helmets • Welding

American Optical Company, 14 Mechanic St., Southbridge, Mass.
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1, N. Y.
Safety Clothing & Equipment Company, 7016 Euclid Ave., Cleveland 3, Ohio.

Hoists • Chain or Electric

Chisholm-Moore Hoist Corp., Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Harnischfeger Corp., P. O. Box 290, Milwaukee, Wis.
Whiting Corp., 15628 Lathrop Ave., Harvey, Ill.
Yale & Towne Mfg. Co., Roosevelt Blvd & Haldeman Ave., Philadelphia 15, Pa.

Hoists • Pneumatic

Independent Pneumatic Tool Co., 175 North State St., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Hose • Oxygen and Acetylene

Air Reduction Sales Co., 60 E. 42nd Street, New York 17, N. Y.
Raybestos-Manhattan, Inc., 61 Willett, Passaic, N. J.
United States Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y.

Hose • Pneumatic

Martin Engineering Co., 704 Rose Street, Kewanee, Ill.
Raybestos-Manhattan, Inc., 61 Willett, Passaic, N. J.
A. Schrader's Son, Div. of Scovill Manufacturing Co., Inc., 470 Vanderbilt Avenue, Brooklyn 17, N. Y.
Schramm Inc., West Chester, Pa.
United States Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y.

Ingots • Aluminum Alloy

Alter Co., 1701 Rockingham Rd., Davenport, Iowa.
Bohn Aluminum & Brass Corp., Aluminum Refiners Div., 1400 Lafayette Building, Detroit, Mich.
Bohn Aluminum & Brass Corp., Michigan Smelting & Refining Div., 1400 Lafayette, Detroit, Michigan.
Christiansen Corporation, 1515 N. Kilpatrick Ave., Chicago 51, Ill.
Colonial Smelting & Refining Co., Columbia, Pa.
Federated Metals Division, American Smelting & Refining Co., Inc., 120 Broadway, New York 5, N. Y.
R. Lavin & Sons, Inc., 3426 S. Kedzie Ave., Chicago, Ill.
Niagara Falls Smelting & Refining Division, Continental Copper & Steel Industries, Inc., 2208 Elmwood Ave., Buffalo 17, N. Y.
North American Smelting Co., Marine Terminal, Wilmington 83, Del.
U. S. Reduction Co., Melville and Chicago Avenues, East Chicago, Indiana
Hyman Viener & Sons, 5300 Hatcher, Richmond, Va.

Ingots • Non-Ferrous

Ajax Metal Co., Frankford Ave & Richmond St., Philadelphia, Pa.
Bohn Aluminum & Brass Corp., Aluminum Refiners Div., 1400 Lafayette Building, Detroit, Mich.
Bohn Aluminum & Brass Corp., Michigan Smelting & Refining Div., 1400 Lafayette, Detroit, Michigan.
Christiansen Corporation, 1515 N. Kilpatrick Ave., Chicago 51, Ill.
Colonial Smelting & Refining Co., Columbia, Pa.
Samuel Greenfield Co., Inc., 31 Stone St., Buffalo, N. Y.
Federated Metals Division, American Smelting & Refining Co., Inc., 120 Broadway, New York 5, N. Y.
Benj. Harris & Co., 11th & State Sts., Chicago Heights, Ill.
R. Lavin & Sons, Inc., 3426 S. Kedzie Ave., Chicago, Ill.
Nassau Smelting & Refining Co., Inc., 1 Nassau Place, Tottenville, Staten Island, N. Y.
Niagara Falls Smelting & Refining Division, Continental Copper & Steel Industries, Inc., 2208 Elmwood Ave., Buffalo 17, N. Y.
North American Smelting Co., Marine Terminal, Wilmington 83, Del.
Silverstein & Pinsof, Inc., 1720 Elston, Chicago, Ill.
U. S. Reduction Co., Melville and Chicago Aves., East Chicago, Ind.
Hyman Viener & Sons, 5300 Hatcher, Richmond, Va.
White Bros. Smelting Corp., Richmond & Hedley Sts., Philadelphia 37, Pa.

Insulation

Quigley Company, Inc., 527 Fifth Ave., New York 17, N. Y.
Tennessee Products & Chemical Corporation, American National Bank Bldg., Nashville, Tenn.

Laboratory and Scientific Equipment

Buehler Ltd., 165 W. Wacker Drive, Chicago 1, Illinois.
Despatch Oven Co., 619 Eighth St., S. E., Minneapolis 14, Minn.
Eastman Kodak Co., 343 State St., Rochester, N. Y.
Great Western Mfg. Co., 208-220 Choctaw St., Leavenworth, Kan.

Laboratory Service

Charles C. Kawin Co., 431 S. Dearborn St., Chicago 5, Ill.
Metlab Co., 1000 Mermaid Lane, Philadelphia.

Ladle Linings • Fitted

Lava Crucible Co., 627 Wabash Bldg., Pittsburgh 22, Pa.

Ladle Linings • Plastic

Alpha-Lux Co., Inc., 155 John St., New York 1, N. Y.
G. & W. H. Corson, Inc., Plymouth Meeting, Pa.
Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh 22, Pa.
The Ironton Fire Brick Co., Ironton, Ohio.
Laclede-Christy Co., 1711 Ambassador Bldg., St. Louis, Mo.
New Jersey Silica Sand Co., Box 71, Millville, N. J.
Pittsburgh Metals Purifying Corp., 1352 Marvista St., N.S., Pittsburgh 12, Pa.
The Ramtite Co., Div. of the S. Obermayer Co., 2563 W. 18th St., Chicago, Ill.

Ladles

Industrial Fabricating, Inc., 817 Hall Street, Eaton Rapids, Mich.
The J. S. McCormick Co., 25th St. & A.V.R.R., Pittsburgh 22, Pa.
Modern Equipment Co., Port Washington, Wis.
Frederic B. Stevens, Inc., 1800 - 18th Street, Detroit 16, Mich.
Whiting Corp., 15628 Lathrop Ave., Harvey, Ill.

Magnetic Separators

Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee, Wisc.
Houghland & Hardy—Hardy Sand Co., Evansville, Ind.

Magnets • Lifting

Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee, Wisc.

Magnets

Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee, Wisc.

Matchplates

Accurate Match Plate Co., 1847-51 W. Carroll Ave., Chicago 12, Ill.
Carlson Pattern Shop, Inc., 616 Berkshire Avenue, Springfield, Massachusetts.
City Pattern Foundry & Machine Co., 1161 Harper at Rivard, Detroit 11, Mich.
Plastic Corp. of Chicago, 2444 S. Central Ave., Cicero 50, Ill.
Pressure Match Plate Co., Inc., 1013-15 N. Front St., Philadelphia 23, Pa.
Scientific Cast Products Corp., 1390 E. 40th St., Cleveland, Ohio.

Metallizing Equipment

Metallizing Company of America, 3520 W. Carroll Ave., Chicago 24, Ill.

Metallographic Equipment

Buehler Ltd., 165 W. Wacker Drive, Chicago 1, Illinois.

Meters • Air Velocity

Illinois Testing Laboratories, Inc., 420 N. La-Salle St., Chicago, Ill.

Mills • Reclaiming

Severance Tool Ind., Inc., Saginaw, Mich.

Milling Cutters

Severance Tool Ind., Inc., Saginaw, Mich.

Mold Conveyors

Chain Belt Company, 1725 West Bruce Street, Milwaukee 4, Wisconsin.
The Fellows Corp., 1012 N. Third St., Milwaukee 3, Wisc.
The Jeffrey Mfg. Co., 977 N. Fourth St., Columbus 16, Ohio.
Link-Belt Company, 300 W. Pershing Road, Chicago 1, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Palmer-Bee Co., 1701 Poland Ave., Detroit 12, Mich.

Mold Ovens and Dryers

Despatch Oven Co., 619 Eighth St., S.E., Minneapolis 14, Minn.
The Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
The Kirk & Blum Mfg. Co., 2876 Spring Grove, Cincinnati, Ohio.

Molding Machines

The Adams Company, 100 East 4th Street, Dubuque, Iowa.
Arcade Mfg. Div., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.
Beardsley & Piper Company, 2424 N. Cicero Ave., Chicago.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Crescent Machine Div., Rockwell Mfg. Co., 600 E. Vienna, Milwaukee, Wisc.
Davenport Machine & Foundry Co., 1628 W. Fourth St., Davenport, Iowa.
The Fellows Corp., 1012 N. Third St., Milwaukee 3, Wisc.
Herman Pneumatic Machine Co., 1806 Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., 1201 North 12th St., La Grange Park, Ill.
The Johnston & Jennings Co., 877 Addison Rd., Cleveland, Ohio.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.
Wm. H. Nicholls Co., Inc., 126 St. & 91st Ave., Richmond Hill, N. Y.
The Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland 14, Ohio.
SPO Incorporated, 7500 Grand Division Ave., Cleveland, Ohio.
The Tabor Manufacturing Co., 6224 Tacony St., Philadelphia 35, Pa.

Monorail and Tramrail Systems

Cleveland Tramrail Div., Cleveland Crane & Engrg. Co., 1155 W. 283rd St., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Palmer-Bee Co., 1701 Poland Ave., Detroit 12, Mich.
Whiting Corp., 15628 Lathrop Ave., Harvey, Ill.

Oils • Lubricating

Delta Oil Products Co., 6263 N. Cedarburg Rd., Milwaukee 9, Wisc.
E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Penola, Inc., 221 N. La Salle St., Chicago 1, Ill.

Ovens • Annealing and Heat Treating

Despatch Oven Co., 619 Eighth St., S. E., Minneapolis 14, Minn.
The Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Whiting Corp., 15628 Lathrop Ave., Harvey, Ill.

Oxygen

Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.
The Linde Air Products Company, Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Patterns

Carlson Pattern Shop, Inc., 616 Berkshire Avenue, Springfield, Massachusetts.
Precision Pattern Works, 5269 W. Grand Ave., Chicago, Ill.
Pressure Match Plate Co., Inc., 1013-15 N. Front St., Philadelphia 23, Pa.

Pattern Coatings and Finishes

The Kindt-Collins Co., 12641 Elmwood Ave., Cleveland, Ohio.
Wellman Products Co., 1444 E. 49th Street, Cleveland 3, Ohio.

Pattern Compound

Tamms Silica Co., 228 N. La Salle Street, Chicago, Ill.

Pattern Lumber

Dougherty Lumber Co., 4300 E. 68th, Cleveland 5, Ohio.
The Kindt-Collins Co., 12641 Elmwood Ave., Cleveland, Ohio.

Pattern Plates

Carlson Pattern Shop, Inc., 616 Berkshire Avenue, Springfield, Massachusetts.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Dougherty Lumber Co., 4300 E. 68th, Cleveland 5, Ohio.
The Freeman Supply Co., 1152 E. Broadway, Toledo 5, Ohio.
The Kindt-Collins Co., 12641 Elmwood Ave., Cleveland, Ohio.
The PMS Co., 1071 Power Ave., Cleveland 14, Ohio.
Scientific Cast Products Corp., 1390 E. 40th St., Cleveland, Ohio.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, Ohio.

Pattern Shop Equipment and Supplies

Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
The Freeman Supply Co., 1152 E. Broadway, Toledo 5, Ohio.
The Kindt-Collins Co., 12641 Elmwood Ave., Cleveland, Ohio.
Oliver Machinery Co., 1025 Clancy Ave. N.E., Grand Rapids 2, Mich.
The PMS Co., 1071 Power Ave., Cleveland 14, Ohio.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, Ohio.

Photographic Materials • Metallography

Buehler Ltd., 165 W. Wacker Drive, Chicago 1, Illinois.
Eastman Kodak Co., 343 State St., Rochester, N. Y.

Pig Iron

Hickman, Williams & Co., 1500 Walnut St., Philadelphia 2, Pa.
Tennessee Products & Chemical Corporation, American National Bank Bldg., Nashville, Tenn.

Pig Iron • Alloy

The Jackson Iron & Steel Co., Jackson, Ohio.
Keokuk Electro-Metals Co., 429 South 4th St., Keokuk, Iowa.

Plaster

Tamms Silica Co., 228 No. La Salle St., Chicago, Ill.

Pneumatic Tools

Buckeye Tools Corp., 29 W. Apple Street, Dayton, Ohio.
Cleco Division of the Reed Roller Bit Company, P. O. Box 2119, Houston 1, Texas.
The Dallett Company, Mascher at Lippincott St., Philadelphia, Pa.
Dayton Pneumatic Tool Company, P. O. Box 747, 8-10 Norwood Ave., Dayton, Ohio.
Independent Pneumatic Tool Co., 175 North State St., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Master Pneumatic Tool Co., Inc., Orwell, O.
The Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Schramm, Inc., West Chester, Pa.

Porosity Equipment and Sealers

Metallizing Company of America, 3520 W. Carroll Ave., Chicago 24, Ill.
Tincher Products Corp., 1715 W. Lake St., Chicago 12, Ill.

Portable Tools • Air

Buckeye Tools Corp., 29 W. Apple Street, Dayton, Ohio.
Cleco Division of the Reed Roller Bit Company, P. O. Box 2119, Houston 1, Texas
Dayton Pneumatic Tool Company, P. O. Box 747, 8-10 Norwood Ave., aDyton, Ohio.
Master Pneumatic Tool Co., Inc., Orwell, O.
The Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Schramm, Inc., West Chester, Pa.

Portable Tools • Electric

Buckeye Tools Corp., 29 W. Apple Street, Dayton, Ohio.
Martindale Electric Co., 1347 Hird Ave., Cleveland 7, Ohio.
The Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
The Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati 4, Ohio.
Syntron Co., 545 Lexington, Homer City, Pa.

Power Units

The Ready-Power Co., 3826 Grand River Ave., Detroit 8, Mich.

Protective Coatings (Industrial)

Tousey Varnish Co., 520 W. 25th St., Chicago 16, Ill.

Pyrometers • Immersion

The Foxboro Co., Neponset Ave., Foxboro, Mass.
Illinois Testing Laboratories, Inc., 420 N. La-Salle St., Chicago, Ill.
The Pyrometer Instrument Co., Inc., Bergenfield, N. J.
Tamms Silica Co., 228 No. La Salle St., Chicago, Ill.

Pyrometers • Optical

Buehler Ltd., 165 W. Wacker Drive, Chicago 1, Illinois.
The Pyrometer Instrument Co., Inc., Bergenfield, N. J.

Radium

Radium Chemical Co., Inc., 570 Lexington Ave., New York 22, N. Y.

Rammers • Pneumatic

Cleco Division of the Reed Roller Bit Company, P. O. Box 2119, Houston 1, Texas.
Dayton Pneumatic Tool Company, P. O. Box 747, 8-10 Norwood Ave., Dayton, Ohio.
Master Pneumatic Tool Co., Inc., Orwell, O.
The Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Schramm, Inc., West Chester, Pa.

Refractories

Alpha-Lux Co., Inc., 155 John St., New York 1, N. Y.
The Carborundum Company, Niagara Falls, New York.
The Cleveland Quarries Company, 1740 E. Twelfth St., Cleveland 14, Ohio.
G. & W. H. Corson, Inc., Plymouth Meeting, Pa.
Jos. Dixon Crucible Co., Jersey City 3, N. J.
Eastern Clay Products, Inc., Jackson, Ohio.
Electro Refractories & Alloys Corp., 344 Delaware Ave., Buffalo 2, N. Y.
Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh 22, Pa.
The Ironton Fire Brick Co., Ironton, Ohio.
Laclede-Christy Co., 1711 Ambassador Bldg., St. Louis, Mo.
Lava Crucible Co., 627 Wabash Bldg., Pittsburgh 22, Pa.
National Crucible Co., Mermaid Lane & Queen St., Philadelphia 18, Pa.
National Foundry Sand Co., 2970 W. Grand Blvd., Detroit 2, Mich.
New Jersey Silica Sand Co., Box 71, Millville, N. J.
Pennsylvania Foundry Supply & Sand Co., Ashland below E. Lewis Sts., Phila. 24, Pa.
The Pyro Refractories Co., Oak Hill, Ohio
Quigley Company, Inc., 527 Fifth Ave., New York 17, N. Y.
The Ramtite Co., Div. of the S. Obermayer Co., 2563 W. 18th St., Chicago, Ill.
Ross-Tacony Crucible Co., Robbins & Milnor Sts., Tacony, Philadelphia 35, Pa.
Frederic B. Stevens, Inc., 1800 - 18th Street, Detroit 16, Mich.

Respirators

American Optical Company, 14 Mechanic Street, Southbridge, Mass.
Martindale Electric Co., 1347 Hird Ave., Cleveland 7, Ohio.
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1, N. Y.
Safety Clothing & Equipment Company, 7016 Euclid Ave., Cleveland 3, Ohio.

Riddles and Screens

Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Great Western Mfg. Co., 208-220 Choctaw St., Leavenworth, Kan.

Safety Clothing and Equipment

American Optical Company, 14 Mechanic Street, Southbridge, Mass.
Clersite Company, 2508 W. Van Buren St., Chicago, Ill.
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn 1, N. Y.
Reece Wooden Sole Shoe Co., 2207 - 11th St., Columbus, Neb.
Safety Clothing & Equipment Company, 7016 Euclid Ave., Cleveland 3, Ohio.
A. Schrader's Son, Div. of Scovill Manufacturing Co., Inc., 470 Vanderbilt Avenue, Brooklyn 17, N. Y.

Sand • Blast

Great Lakes Foundry Sand Co., 720 United Artists Bldg., Detroit 26, Mich.
Houghland & Hardy—Hardy Sand Co., Evansville, Ind.
Manley Sand Co., Rockton, Ill.
National Pulverizing Co., Millville, N. J.
New Jersey Silica Sand Co., Box 71, Millville, N. J.
Ottawa Silica Co., Box 437, Ottawa, Ill.
George F. Pettinos, Inc., 1206 Locust Street, Philadelphia, Pa.
Tamms Silica Co., 228 No. La Salle St., Chicago, Ill.
Whitehead Brothers Co., 324 W. 23rd Street, New York 11, N. Y.

Sand • Core and Mold

Ayers Mineral Company, Masonic Temple, Zanesville, Ohio.
Carpenter Brothers, Inc., 606 West Wisconsin Avenue, Milwaukee 3, Wisconsin.
Central Silica Co., Zanesville, Ohio.
Delhi Foundry Sand Co., 6326 River Road, Cincinnati, Ohio.
Great Lakes Foundry Sand Co., 720 United Artists Bldg., Detroit 26, Mich.
Hickman, Williams & Co., 1500 Walnut St., Philadelphia 2, Pa.
Houghland & Hardy—Hardy Sand Co., Evansville, Ind.
Manley Sand Co., Rockton, Ill.
The Millwood Sand Co., Masonic Temple, Zanesville, Ohio.
National Foundry Sand Co., 2970 W. Grand Blvd., Detroit 2, Mich.
National Pulverizing Co., Millville, N. J.
New Jersey Silica Sand Co., Box 71, Millville, N. J.
Ottawa Silica Co., Box 437, Ottawa, Ill.
George F. Pettinos, Inc., 1206 Locust Street, Philadelphia, Pa.
Taggart Brimfield Co., Inc., P. O. Box 272, Hammonton, N. J.
Whitehead Brothers Co., 324 W. 23rd Street, New York 11, N. Y.

Sand Blast Equipment

Alloy Metal Abrasive Co., 311 West Huron Street, Ann Arbor, Michigan.
American Wheelabrator & Equipment Corp., 630 South Byrkit St., Mishawaka, Indiana.
The Macleod Co., 2232-40 Bogen St., Cincinnati 22, Ohio.
Pangborn Corporation, Hagerstown, Md.
Safety Clothing & Equipment Company, 7016 Euclid Ave., Cleveland 3, Ohio.
The W. W. Sly Manufacturing Co., 4700 Irwin Ave., Cleveland 2, Ohio.

Sand Control and Testing Equipment

Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich.

Sand Handling and Conditioning Equipment

Allis Chalmers Mfg. Co., 1126 S. 70th Street, Milwaukee, Wis.
The C. O. Bartlett & Snow Company, 6200 Harvard Avenue, Cleveland, Ohio.
Beardsley & Piper Company, 2424 N. Cicero Ave., Chicago.
Bell Aircraft Corp., Prime Mover Division, P. O. Box 1, Buffalo 5, New York.
Chain Belt Company, 1725 West Bruce Street, Milwaukee 4, Wis.
The Frank G. Hough Co., Libertyville, Ill.
The Jeffrey Mfg. Co., 977 N. Fourth Street, Columbus 16, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Material Movement, Industries, Inc., 9257 Laramie, Skokie, Ill.
The Moulders' Friend, Dallas City, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Nichols Engineering & Research Corp., 70 Pine Street, New York 5, N. Y.
Palmer-Bee Co., 1701 Poland Ave., Detroit 12, Mich.
Royer Foundry & Machine Co., 158 Pringle St., Kingston, Pa.

Sand Mixers

Beardsley & Piper Company, 2424 N. Cicero Ave., Chicago.
Blystone Div., Standard Sand & Machine Co., 549 W. Washington Blvd., Chicago 6, Ill.
Clearfield Machine Co., Box 249, Clearfield, Pa.
The Fordath Engineering Co., Ltd., Hamblet Works, Albion Road, West Bromwich, Staffordshire, England.
The Freeman Supply Co., 1152 E. Broadway, Toledo 5, Ohio.
The Moulders' Friend, Dallas City, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago 6, Ill.

Sand Reclamation

Butler Bin Co., Waukesha, Wis.
Dings Magnetic Separator Co., 4740 West Electric Ave., Milwaukee, Wis.
The Hydro-Blast Corp., 2550 N. Western Ave., Chicago, Ill.
Invincible Vacuum Cleaner Mfg. Co., 14th & Davis St., Dover, Ohio.
The Jeffrey Mfg. Co., 977 N. Fourth Street, Columbus 16, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago 6, Ill.
Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.

Saws • Metal Cutting

Capewell Manufacturing Co., 60 Governor Street, Hartford 2, Conn.
The DoALL Co., 254 N. Laurel Ave., Des Plaines, Ill.
Martindale Electric Co., 1347 Hird Ave., Cleveland 7, Ohio.
Oliver Machinery Co., 1025 Clancy Ave. N.E., Grand Rapids 2, Mich.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, Ohio.

Saws • Woodworking

The DoALL Co., 254 N. Laurel Ave., Des Plaines, Ill.
Oliver Machinery Co., 1025 Clancy Ave. N.E., Grand Rapids 2, Mich.

Separators

Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee, Wisc.
Jas. A. Murphy & Co., Fifth and Vine Sts., Hamilton, Ohio.
Royer Foundry & Machine Co., 158 Pringle St., Kingston, Pa.
The Tabor Manufacturing Co., 6224 Tacony St., Philadelphia 35, Pa.

Shake-out Machinery

Allis Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee, Wis.
Beardsley & Piper Company, 2424 N. Cicero Ave., Chicago, Ill.
The Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago 6, Ill.
Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J.
Royer Foundry & Machine Co., 158 Pringle St., Kingston, Pa.
Simplicity Engineering Co., Durand, Mich.

Shock Absorption Materials

Raybestos-Manhattan, Inc., 61 Willett, Passaic, N. J.

Shot and Grit

The American Steel Abrasives Co., Sherman & East Sts., Galion, Ohio.
Carpenter Brothers, Inc., 606 West Wisconsin Avenue, Milwaukee 3, Wisconsin.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
The Globe Steel Abrasive Co., 238 First Ave., Mansfield, Ohio.
Great Lakes Foundry Sand Co., 720 United Artists Bldg., Detroit 26, Mich.
Hickman, Williams & Co., 1500 Walnut St., Philadelphia 2, Pa.
Pennsylvania Foundry Supply & Sand Co., Ashland below E. Lewis Sts., Phila. 24, Pa.
Pittsburgh Crushed Steel Co., 4839 Harrison St., Pittsburgh, Pa.
Steel Shot & Grit Co., Inc., 39 Warren Bridge, Boston 14, Mass.
Steel Shot Producers, Inc., Box 67, Butler, Pa.

Silica Flour

National Pulverizing Co., Millville, N. J.
Ottawa Silica Co., Box 437, Ottawa, Ill.

Spectographic Equipment

Buehler Ltd., 165 Wacker Drive, Chicago 1, Illinois.
Eastman Kodak Co., 343 State St., Rochester, N. Y.

Temperature Control and Recording Devices

The Foxboro Co., Neponset Ave., Foxboro, Mass.
Illinois Testing Laboratories, Inc., 420 N. La-Salle St., Chicago, Ill.

Thermocouples

The Foxboro Co., Neponset Ave., Foxboro, Mass.
Illinois Testing Laboratories, Inc., 420 N. La-Salle St., Chicago, Ill.
Tamms Silica Co., 228 N. LaSalle St., Chicago, Ill.

Tote Boxes and Barrels

The Kirk & Blum Mfg. Co., 2876 Spring Grove, Cincinnati, Ohio.

Tractors and Trucks

Bell Aircraft Corp., Prime Mover Division, P. O. Box 1, Buffalo 5, New York.
Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore.

Tumbling Barrels • Dry

N. Ransohoff, Inc., 16 E. 72nd St., Cincinnati 16, Ohio.
The W. W. Sly Manufacturing Co., 4700 Irwin Ave., Cleveland 2, Ohio.

Tumbling Barrels • Wet

N. Ransohoff, Inc., 16 E. 72nd St., Cincinnati 16, Ohio.

Vacuum Cleaning Equipment

Invincible Vacuum Cleaner Mfg. Co., 14th & Davis St., Dover, Ohio.
Roots-Connersville Blower Corp., 900 West Mount St., Connersville, Ind.
Spencer Turbine Co., 486 New Park Avenue, Hartford 6, Conn.
U. S. Hoffman Machinery Corp., 99 Fourth Ave., New York 3, N. Y.

Ventilating Systems

The Kirk & Blum Mfg. Co., 2876 Spring Grove, Cincinnati, Ohio.
Powermatic Ventilator Co., 4019 Prospect Ave., Cleveland 3, Ohio.
H. H. Robertson Co., 2400 Farmers Bank Bldg., Pittsburgh 22, Pa.
Claude B. Schneible Co., 2827 - 25th Street, Detroit, Mich.

Vibrators

Arcade Mfg. Div., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.
The Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13, Ohio.
Crescent Machine Div., Rockwell Mfg. Co., 600 E. Vienna, Milwaukee, Wis.
The Dallett Company, Mascher at Lippincott St., Philadelphia, Pa.
Davenport Machine & Foundry Co., 1628 W. Fourth St., Davenport, Iowa.
Herman Pneumatic Machine Co., 1806 Union Bank Bldg., Pittsburgh 22, Pa.
Martin Engineering Co., 704 Rose St., Kewanee, Ill.
The Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland 14, Ohio.
SPO Incorporated, 7500 Grand Division Ave., Cleveland, Ohio.
Simplicity Engineering Co., Durand, Mich.
Syntron Co., 545 Lexington, Homer City, Pa.

Wash Room Equipment

Bradley Washfountain Co., 2203 W. Michigan Street, Milwaukee, Wis.

Welding and Cutting Equipment

Arcos Corporation, 1500 South 50th Street, Philalelphia 43, Penna.
The Linde Air Products Company, Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Welding Rods

Arcos Corporation, 1500 South 50th Street, Philalelphia 43, Penna.
Haynes Stellite Co., Union Carbide and Carbon Corp., Kokomo, Ind.
International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
The Linde Air Products Company, Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Wheelbarrows

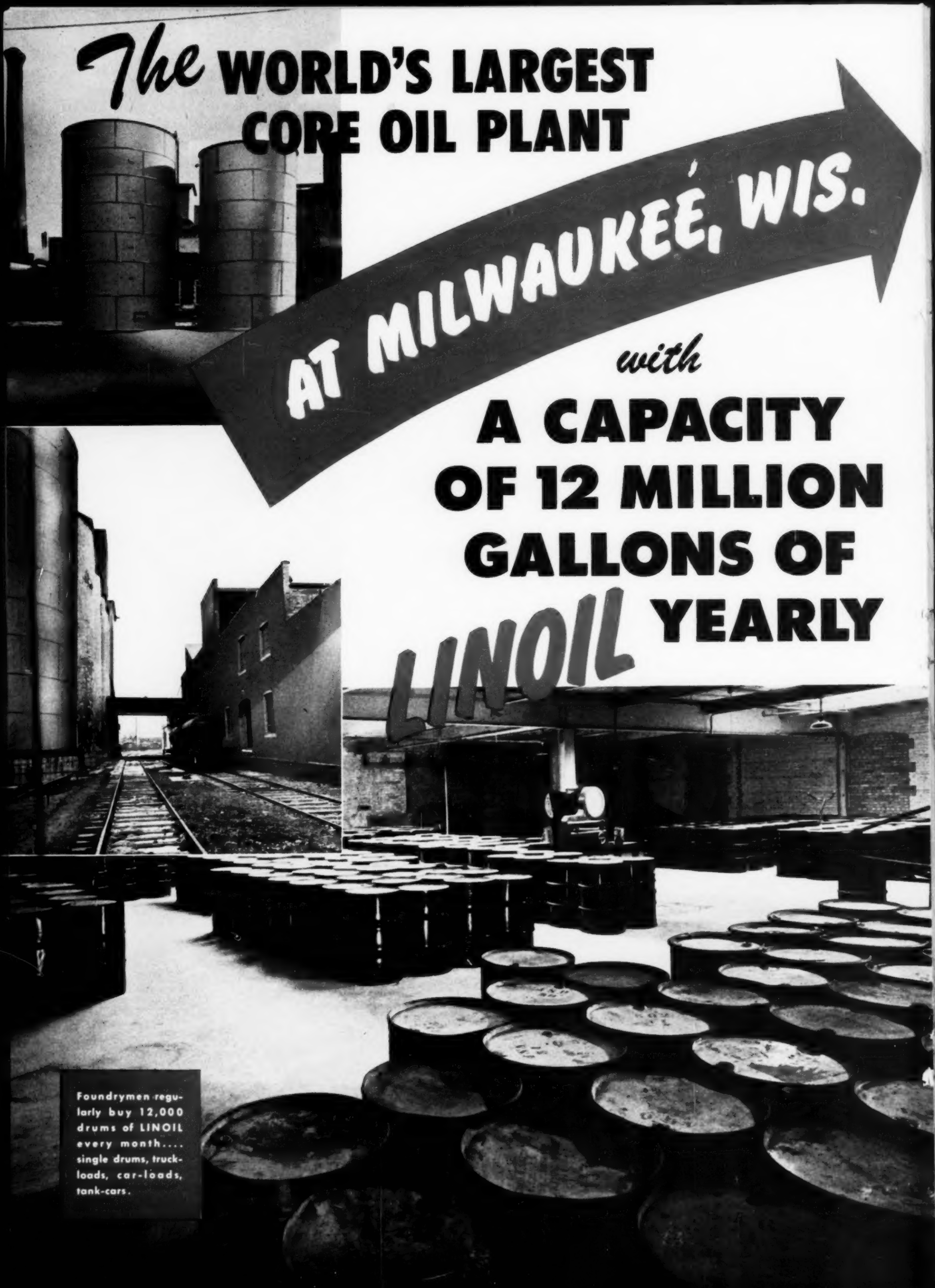
Bell Aircraft Corp., Prime Mover Division, P. O. Box 1, Buffalo 5, New York.
Sterling Wheelbarrow Co., 7036 W. Walker St., Milwaukee 14, Wis.

Woodworking Machinery

The Kindt-Collins Co., 12641 Elmwood Ave., Cleveland, Ohio.
Oliver Machinery Co., 1025 Clancy Ave. N.E., Grand Rapids 2, Mich.
Wellman Products Co., 1444 E. 49th St., Cleveland 3, Ohio.

X-Ray Equipment

Eastman Kodak Co., 343 State St., Rochester, N. Y.
General Electric X-Ray Corp., 4855 W. McGeoch, Milwaukee 14, Wis.


The WORLD'S LARGEST
CORE OIL PLANT
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OF 12 MILLION
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Foundrymen regularly buy 12,000 drums of LINOIL every month.... single drums, truck-loads, car-loads, tank-cars.